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The AUTOMOBILE

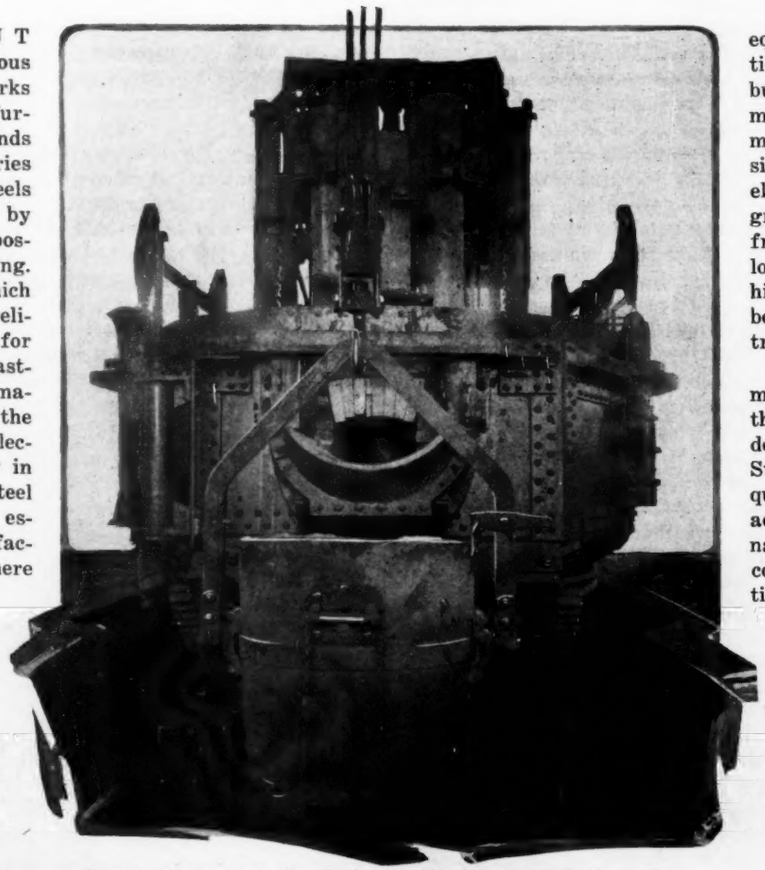
Electric Furnace Steels for Dynamic Stresses

Rapid Adoption of Improved Method Points to Coming General Use of Purer and Stronger Materials

By J. Edward Schipper

THROUGHOUT the country various iron and steel works are installing electric furnaces to meet the demands made in many industries for the high grade steels which can be produced by the super-refinement possible with electric heating. The demand for steel which must be the acme of reliability and the necessity for machined parts where wastage, due to impure material, shall be cut to the limit, has rendered the electric furnace a necessity in the manufacture of steel for many purposes, and especially, in the manufacture of automobiles where lightness and dynamic strength make the highest demand on materials.

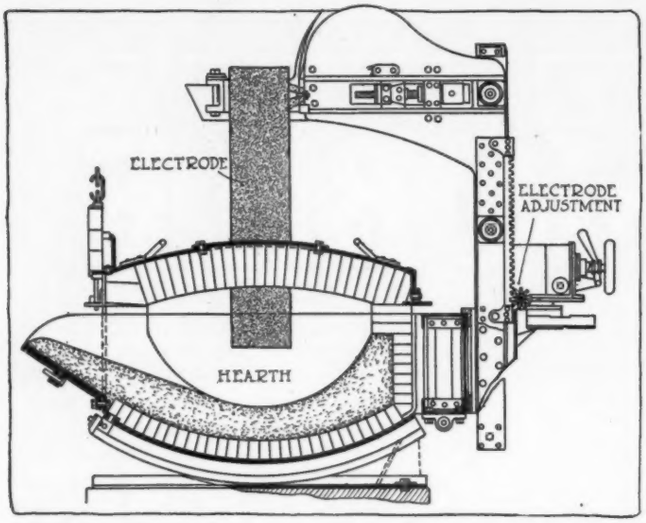
Looking back ten years the development of the electric furnace and its application to steel refinement is marvelous. The few specimens of highly-refined steel then turned out in laboratories equipped with this application of electric heat made but little impression on the minds of the practical steel men of the day. Gradually, since that time, the use of electric steels has been growing and now in cars from the highest to the lowest price are found high-duty parts which have been produced by the electric furnace method.



Electric furnace at the Buchanan Electric Steel Co.'s works. Note rack arrangement for tilting the furnace

Although generally foremost in taking up and thoroughly utilizing a new development, the United States has not been as quick to avail itself of the advantages of electric furnace steel as have other countries. Authorities estimate that in the United States there are produced at present about 9000 tons per annum of electric alloy steels. In Germany there is produced per month as much as is turned out in the United States in a year.

At the beginning it must be understood that electric steels are more



Section through the Heroult furnace showing the construction of the hearth and mounting of the electrodes

expensive than those made by the open-hearth or other processes. Therefore, when electric steels are adopted, it must be because those who use them believe that the advantages offset the higher first cost of the material. While still a largely debated point it is undoubtedly true that most metallurgists are at the present time of the belief that not only is the electric steel worth the difference in price but that it results in a saving in many instances and furthermore a greater demand for its use would so reduce the price as to make the difference between it and open-hearth steel negligible.

Broadly speaking, the advantages of the electric furnace are largely centered about the facts that it is possible to confine the temperature variations within very narrow limits and that it is possible to carry out the high refining temperatures without exposing the molten metal to harmful gases. Metal made by this process, therefore, is nearer the complete state of refinement, containing a minimum amount of sulphur and phosphorus, being completely deoxidized and free from gases and nitrides.

The standard phosphorus and sulphur contents in open-hearth steel, unless special pig is used at an increased price, is 0.04 per cent. With special pig some mills will guarantee 0.035, the standard practice with the best manufacturers in electric steel is a guarantee of 0.02 sulphur and 0.015 phosphorus. The steel made by this process is, because of more absolute temperature control, more uniform. In the electric furnace the losses are confined to sulphur, oxides, gases and nitrides and all additions in the manufacture of alloy steel are made in the furnace and, as a result, these additions are more uniformly blended. In the open-hearth steel many of the alloys are added in the ladle or in the furnace only a few minutes before the heat is tapped. As a result the alloying substances do not have the same opportunity to become uniformly disposed through the material.

Five Great Advantages

In the electric furnace, on account of the closely maintained temperature, it is possible to cast the metal at nearer the desired temperature than is generally the case with the open-hearth. This gives greater uniformity in the ingots. To sum up it might be said that the direct advantages of electric furnace steel would be as follows:

Great uniformity, physically and chemically.

Higher degree of indestructibility in the thermal manipulation, *i.e.* forging or heat treatment after manufacture of the bars.

Due to freedom from oxides, gases, etc., the metal has a wider hardening range in heat treatment.

Owing to freedom from impurities it will have a longer life and be better qualified to resist dynamic stresses.

It will machine somewhat better than the average open-hearth and forge about the same, with the advantage of being more fool-proof in the heat manipulation.

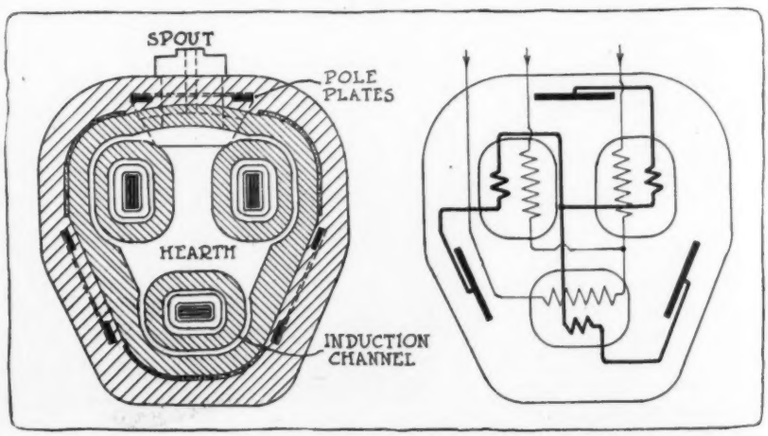
High Dynamic Strength

As to physical properties, an electric steel will be more uniform than in other processes because of the higher degree of purity. It is a fact, however, that these qualities will not greatly exceed those of the soundest part of an open-hearth ingot in which particular care has been paid to the process of manufacture. This of course refers to the static strength. But what is of extreme interest in automobile construction is dynamic strength, and it is for this reason that electric furnace steel should prove of great value to the automobile industry.

To offset the advantages many believe that under present conditions electric furnace steel will never reach the same quantity production as the open-hearth and therefore will always be more expensive. In the first place although steel is made in the electric furnace this alone is not a guarantee as to its quality; lack of widespread knowledge regarding the manufacture of electric steel is a handicap. Some engineers who have not closely followed progress in this work go so far as to state that the only good use to which electric furnace steel could be put by automobile manufacturers would be in case of faulty design where it would be necessary to replace a weak part by one of similar design but better material.

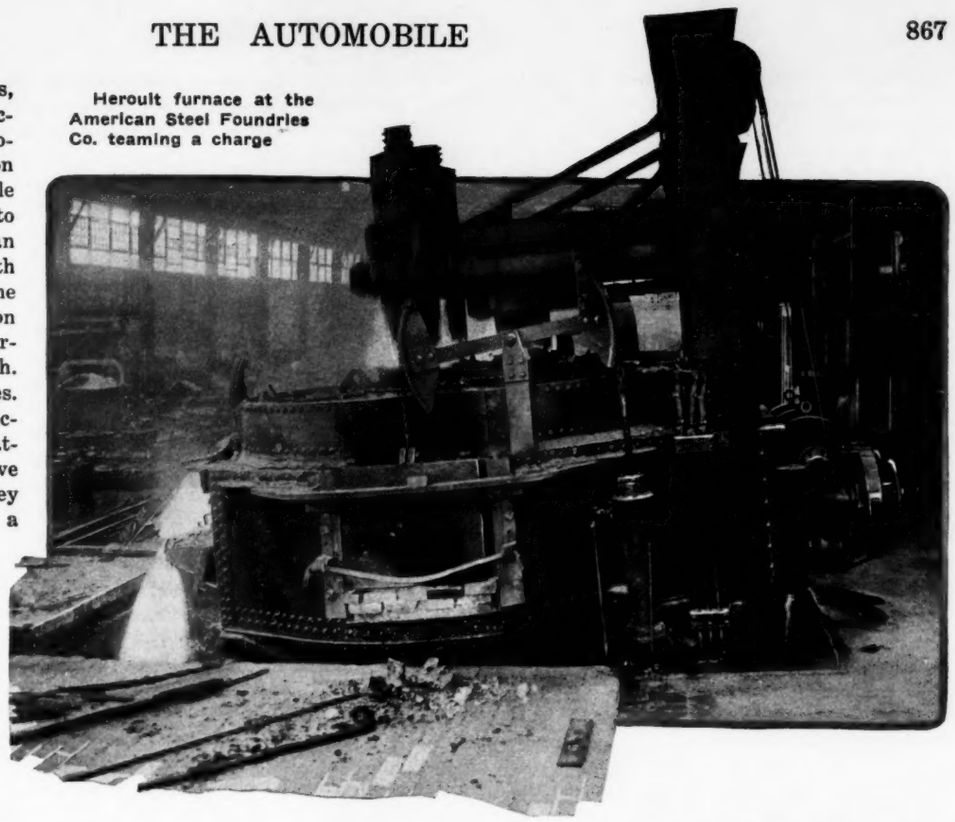
Weighing the advantages against the disadvantages it seems quite reasonable to expect that the use of electric furnace steel will grow rapidly in this country. The United States, with its population of 96,000,000 and a present production of electric steel of 9000 tons per annum, is not going to remain permanently at this stage in steel development while Germany, for instance, with its population of 56,000,000, has an annual output of electric steel of 108,000 tons. Although our output is small it is constantly growing, and in addition, America has been hitherto purchasing large quantities of imported alloy steels, but since the war has started these sources of supply have been interrupted and the result is that the electric furnace steel industry in this country is growing so rapidly that electric furnaces are continuously being added to the equipment of our steel manufacturers.

With the chief obstacle in the way of the use of large quantities of electric steel being the comparatively small produc-



Diagrammatic view of the Rochling-Rodenhauser furnace with layout of wiring connections

tion with resulting high prices, this turning toward America's factories for this kind of steel is going to have a beneficial effect on the entire industry and automobile manufacturers will not be slow to realize that there is oftentimes an actual saving in connection with electric steel. At the present time it costs approximately $45 per ton more to manufacture electric furnace steel than it does open-hearth.



Heroult furnace at the American Steel Foundries Co. teaming a charge

This is due to several causes. The most successful types of electric furnaces are covered by patents and the steel companies have to pay a royalty for every ton they make. Again, electricity as a heating unit is more expensive than coal or gas which are employed in the open-hearth. The high cost of the electrodes burnt away in the manufacture of steel is another contributing cause and, finally, the smaller heats, because electric furnace steel is made in 6- to 20-ton furnaces whereas open-hearth alloy steels are made in 50- to 65-ton furnaces. Another point often brought up is that in order to keep down the carbon range, more expensive alloys have to be used than in the open-hearth, that is to say, alloying substances of the carbonless variety which, as a rule, cost considerably more.

Due to the peculiar conditions which obtain in the working of alloy steels, better results are obained in some instances by charging cold material directly into the electric furnace. In other steels better results are obtained by melting in the open-hearth and then charging the hot metal into the electric furnace for ultimate refining and for adding the alloying substances.

For Automobile Work

In automobile work the majority of the materials used do not have to be of very close analysis to give desirable service, but there are a few parts which are of such great importance that the finest possible material is not too good for use. By using electric furnace steels on such parts a great amount of trouble is avoided because electric furnace steel, due to its high temperature of refinement and superior chemical composition is closer grained and has higher physical qualities than the average open-hearth steel.

Furthermore, the percentage of wasted parts where considerable machining is done is much reduced by its use and this reduction is such a potent factor where the ratio of machine cost to material cost is high that the initial difference in the price of the material is equalized.

In the use of ordinary alloy open-hearth steels a large number of highly-machined parts might often necessarily have to be thrown aside due to the encountering of a spot of impurity or some slight subcutaneous defect. The loss in time of the machine and the workman would be far more costly than the difference in price between the two steels and, at the same time, owing to the better physical qualities of the electric steel, a better part would have been made. Discarding finished pieces where expensive forges, dies, milling machines, drills, etc., have been employed in the various stages of the work together with high-priced machinists, is a serious wastage.

It is true that the mere fact that steel is made in the electric furnace is not a guarantee as to its quality, but with steel properly made in the electric furnace, using the same methods and care that are customary in the small mills, or in other words, quality work as contrasted with solely quantity work, electric furnace steel will be far superior to the ordinary open-hearth product because it will be made in small heats and small ingots which means a safeguard against segregration. Electric furnace steel is freer from sulphite of manganese and also slag, which is particularly harmful in case-hardened parts. The presence of slag is one of the principal reasons for the pitting and spoiling of case-hardened parts.

Another advantage of electric steels is that being handled in small units it will ordinarily receive much more careful inspection, so that surface defects and pipes wlll be detected.

An interesting fact concerning tungsten magnet steel used in the permanent magnets of magnetos is that when made in the electric furnace it has a higher retentivity than when made by any other method. Probably the close structure of the molecular arrangement is of influence.

History of Electric Furnace

The electric furnace is not a new development, although its practical application is one of the phases of modern industry. Probably the first electric heat machines were the mechanisms and apparatus employed by Davy, who in the year 1810 produced heat in the electrolysis of aluminum oxide. His apparatus consisted of a platinum plate connected with one pole of a thermopile of 1000 plates, the other pole being connected to an iron wire. The iron wire projected into a layer of clay carried by the platinum plate which was in connection with the other pole. When the current was switched on the iron wire became white hot and melted where it was in contact with the clay.

Five years later Pepys welded an iron wire by heating it with an electric furnace and in 1843 it was first suggested by A. Wall that electric current be used in treating pig iron in the converter. In 1853 there was a French patent granted to Pichon for the first electro-thermic furnace. This was the first direct commercial application of electric current to furnace work and made use of the electric arc.

A great forward impulse was given to the possibilities of electric furnace steels when William von Siemen patented his furnaces in the years 1878 and 1879. Siemen's furnaces varied in design. The first was a crucible surrounded by a metallic case through the bottom of which projected one pole of an electric circuit. On this was mounted a platinum electrode, the second electrode entered through the cover of the furnace and in order to preserve it and give it the longest possible life it was cooled by water, a practice which still obtains. There was a heat-protecting cover for the furnace and the crucible was insulated to prevent radiation. Another furnace used by Siemen was very similar to that of Pichon.

Siemen's Furnace a Pioneer

With the Siemen furnace it was possible to melt 22 lb. of steel an hour and with it he could even fuse metals of such high melting point as platinum, having succeeded in liquefying 8.8 lb. of the latter in 15 min. The only reason that the Siemen furnace was not an immediately commercial success was due to the high cost of electric current in those days. The present types of successful furnace such as those of Stassano, Heroult, Kjellin and Taussig appeared after 1890 and particularly between the years of 1898 and 1910. From that time it has been a matter of refinement of the constructions originated by these men, until to-day it seems as if we were on the verge of a rapid adoption of the electric furnace by steel makers generally.

One of the objections which some have urged against the electric furnace is that it requires the services of high-priced men to operate them. Some have claimed that the workmen in charge of detail labor on these machines must be electrical engineers but the growing tendency toward the use of automatic control is eliminating the necessity for men with a highly theoretical electrical education. The objection of one of the leading metallurgists in the automobile industry to the electric furnace is that the time and high degree of skill necessary to produce the improved qualities in material seems out of proportion to the advantages gained except for special cases. It is quite true that the open hearth furnace properly manipulated can keep the two impurities, oxygen and sulphur within such low limits that the material will perfectly satisfy the requirements for the great majority of constructions. Given the same amount of skill in both cases the electric furnace will doubtlessly remove more oxygen and sulphur from steel than can the open hearth.

Three Broad Classes of Furnace

It should not hold true that more expensive materials can enter into the construction of a high-priced car than a low priced one, as there need not be any relationship between the selling price of a car and the quality of the material which enters into it. The same relative proportions of very high grade steel to ordinary constructive material can hold true regardless of price, and hence the additional skill required in manipulating the furnace would not seem to limit the use of the steel to only high-priced cars.

Electric furnaces in general use can be classified under the broad heads of the arc furnace, the induction furnace and the shaft furnace. All three are based on well known electrical phenomena and in the fundamentals, are simple. In the arc furnace the entire theory and construction depend on the fact that if the ends of two current-carrying wires are brought together so as to complete the circuit and are then separated, the current will not be interrupted, but there will appear a small highly-luminous flame bridging the gap between the two ends of the wires. This separation of the electric current is what is known as drawing the arc. The theory of the arc is that at the instant of separation of the wires a great rise of resistance takes place at the point of separation and, since resistance causes heat, a quick rise in temperature also takes place. Under the influence of this heating the metal evaporates at the points of contact. If the separation should be increased the distance between the ends of the wires becomes filled with metallic gases which transfer the current across the gap. Since these gases are of high resistance a continuous glow is maintained.

The ends of the two wires correspond with the electrodes, and the gasification of these electrodes consumes them so that were the correct distance between them not continuously maintained the arc would be broken on account of the evaporation which would open the gap too far by the destruction of the electrodes. The ordinary arc lamp is a good illustration of the arc theory. The electrodes used in the arc lamp are usually ordinary pure carbon. The arcs in electric furnaces are made in a very similar way. The electrodes commonly employed are carbons, as a very high temperature is maintained with this sort of gap. The reason for this is that in carbon the greatest resistive conducting material is found and the gasification is at about 3500 deg. C. This is the arc temperature used with iron and steel when carbon electrodes are employed.

The different types of furnace made under the general head of the arc classification vary with the different manufacturers. Some of the principal furnaces made using the arc theory as the basis of their design are the Heroult, Stassano and Girod.

Induction Type Often Used

The next main classification of electric furnaces is the induction type. It is a known fact that when an electric current is passing through an insulated coil it is continually generating lines of force. If the current through the coil is alternating, the lines of force are also alternating and any electrical conductor in the path of these alternating lines of force will have a current induced in it. The strength of this current induced would be proportional to the number of lines of force cut by the conductor. In regulating the strength of this current there are two or three fundamental facts which

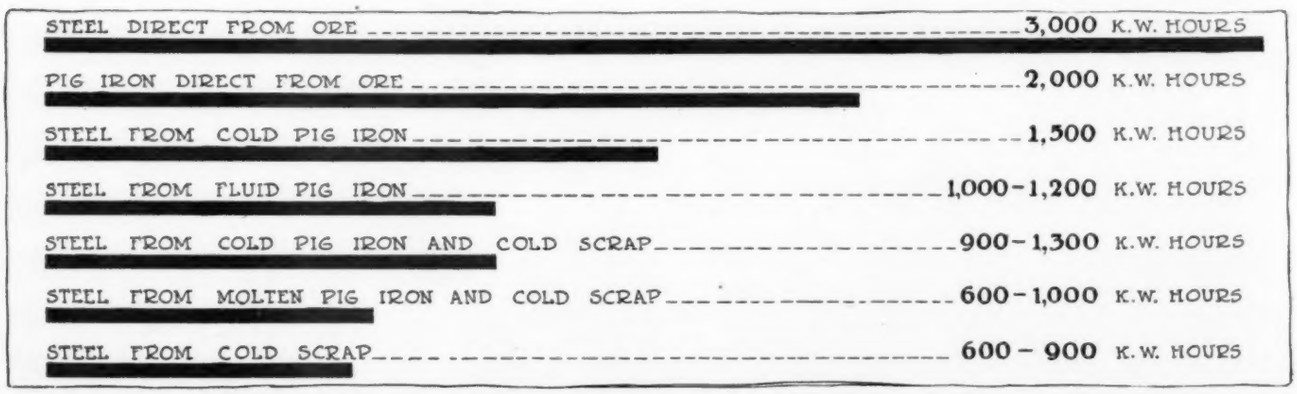

STEEL DIRECT FROM ORE 3,000 K.W. HOURS
PIG IRON DIRECT FROM ORE 2,000 K.W. HOURS
STEEL FROM COLD PIG IRON 1,500 K.W. HOURS
STEEL FROM FLUID PIG IRON 1,000-1,200 K.W. HOURS
STEEL FROM COLD PIG IRON AND COLD SCRAP 900-1,300 K.W. HOURS
STEEL FROM MOLTEN PIG IRON AND COLD SCRAP 600-1,000 K.W. HOURS
STEEL FROM COLD SCRAP 600-900 K.W. HOURS

Chart of kilowatt-hours estimated to carry out work by electric furnace methods

govern design. In the first place the voltage of the induced or secondary current is proportional to the number of turns of wire. Secondly, the strength of the current is inversely proportional to the voltage and inversely proportional to the number of turns.

This latter fact outlines the basic problem of induction furnaces which are really special transformer units. Every induction furnace has first its iron core and yoke surrounded by a primary winding and a secondary winding much in the same manner as a magneto except that in the case of the furnace this winding is composed either entirely of, or for the most part, of the bath itself. This allows of a subclassification of induction furnaces; those in which the high-tension or secondary winding is composed entirely of the bath, such as the simple induction furnaces; or where the bath forms part of the secondary winding with an additional winding made of copper to aid in the heating, as in the combination furnaces. The induction furnaces which are perhaps better known than any others in this country are the following: Kjellin, Rochling-Rodenhauser, and Snyder.

The electric shaft furnace is the resultant of the attempt to replace the fuel in the blast furnace by electric heat. In other words, it is merely a variation of the blast furnace with electric instead of flame heat.

Heroult Furnace Is Popular

While space does not permit to go into a detailed description of the various furnaces it might be interesting to mention the Heroult furnace as probably that in most common use. There are in this country at the present time about forty-two electric furnaces, nineteen of these are of the Heroult type, six of the Girod type, six induction furnaces, four Stassano, five Snyder and two miscellaneous. Of this number approximately 75 per cent are located in the Eastern States, and the capacities range from ¼ of a ton to 20 tons.

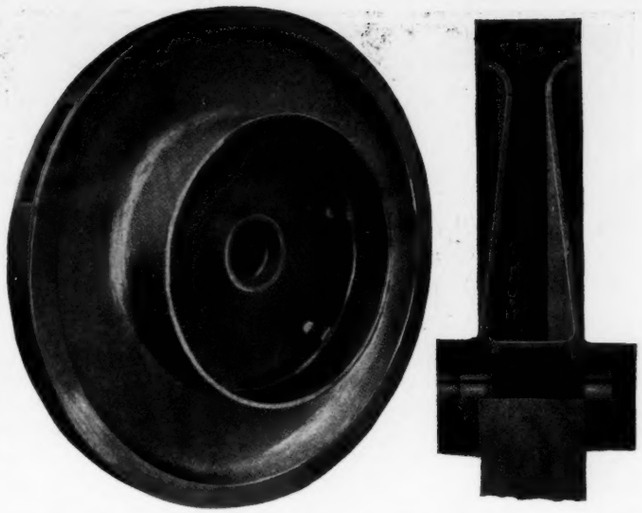
The accompanying illustrations show a furnace of the Heroult design which was recently installed in one of the plants of the American Steel Foundries. Referring to the illustrations at the tops of pages 866 and 867, this furnace, which is a 6-ton basic design, is shown in such a way that the three electrodes may be observed at the center. As stated, the Heroult furnace is of the arc type and this particular installation operates on a three-phase alternating current of 100 volts. The threaded projections at the ends of the electrodes are to allow new electrodes to be screwed on to the old ones thus eliminating any waste.

The electric current is stepped down from 11,000 volts to 100 volts in the transformer house and connections to the electrodes are made by heavy copper bars. Both the annular copper castings which hold the electrodes and the bushings where the electrodes pass through the roof of the furnace are water cooled. The path of the current is through the metal from one electrode to the other, the arc producing an intense heat which reduces the metal.

The electrodes are supported from the framework at the rear and each electrode is raised or lowered by an electric motor at the base of this framework. On the wall of the transformer house may be seen a delicate regulating mechanism which controls these motors and automatically keep the ends of the electrodes a short distance from the surface of the metal. Thus any surges of metal within the furnace will immediately react on the regulating mechanism and the electrodes will be kept at the proper distance from the molten metal.

Furnace Tilted by Rack

The furnace has a bowl-shaped bottom on which are two parallel curved castings with gear teeth, similar to a rack. By means of an electric motor, the furnace can be tilted or rolled on these plates to the angle required in drawing off heat. The tilting mechanism consists of a 40-hp. motor, driving direct on a large gear. A connecting-rod from the gear to the base of the furnace transmits the power for tilting and also makes the tilting mechanism "fool proof," for when the connecting-rod reaches its highest position, the gear in continuing its revolution will draw the furnace back to its normal position. The pit under the furnace is about 10 ft. deep and as the roller plates rest on pedestals, there is ample room for workmen to clean out slag, etc.



Single and double-disk wheels made from electric furnace castings

Movable Steel Heat Table

A very ingenious feature designed especially for this furnace by the plant engineering department of the American Steel Foundries, is the movable table in front of the tap hole. This table is covered with fire brick and is mounted on four wheels. When ready to take a heat from the furnace, this platform is rolled back on its track and the ladle is dropped into the put as usual. When the ladle is removed after drawing off the heat, the table is quickly pushed back so that the men can work on the tap hole with ease. In former furnace installations this has been a source of more or less trouble, as a few boards or a cover had to be placed over the hole, which was unsatisfactory and more or less dangerous. The new arrangement is very satisfactory.

The furnace has two charging doors, one on either side. These, together with the tap door, are operated by air. The furnace roof of course is of brick and it is inclosed in a steel ring in such a manner that the whole roof can be lifted off with a crane and a new one put in its place when necessary.

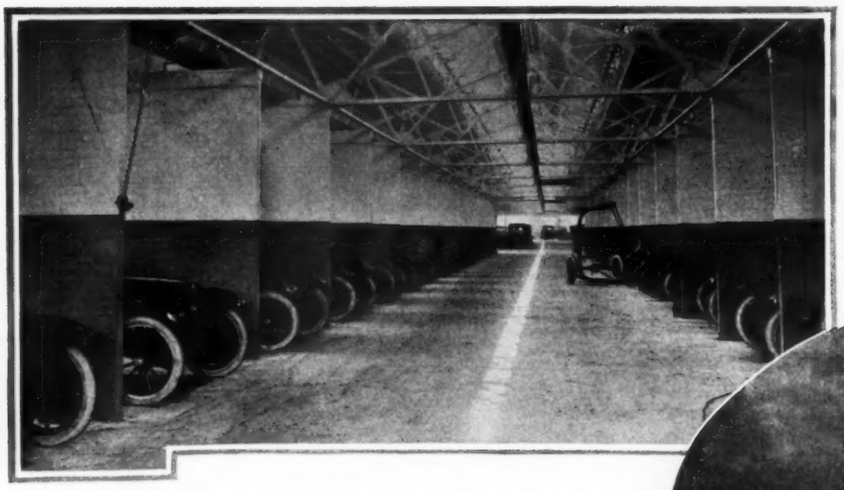
This furnace is typical of the very latest practice in electric furnace installations and is able to meet the most exacting demands in steel castings.

Physical Characteristics of Sample Electric Chrome-Nickel Steels

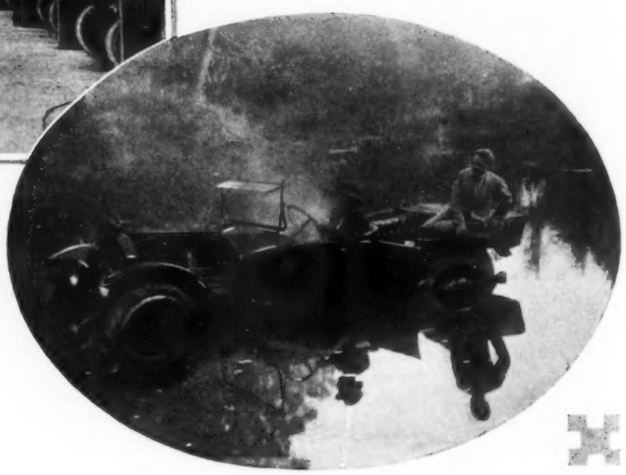
C%	E.L.	M.S.	Elon.	Red.	B.H.	Remarks **
.20	55,000	86,000	39.5	69.2	170	Annealed
	170,000	210,000	13.5	51	400	1525°-Oil - 400°F.
.40	60,000	90,000	29.5	66.9	175	Annealed
	230,000	280,000	9.5	35	490	1525°-Oil - 400°F.
	150,000	170,000	16.5	57.3	325	1525°-Oil-1000°F.
.50	62,000	97,000	25	54.6	180	Annealed
	215,000	216,000	8	37	446	1525°-Oil - 600°F.
	240,000	290,000	6	33	495	1525°-Oil - 400°F.

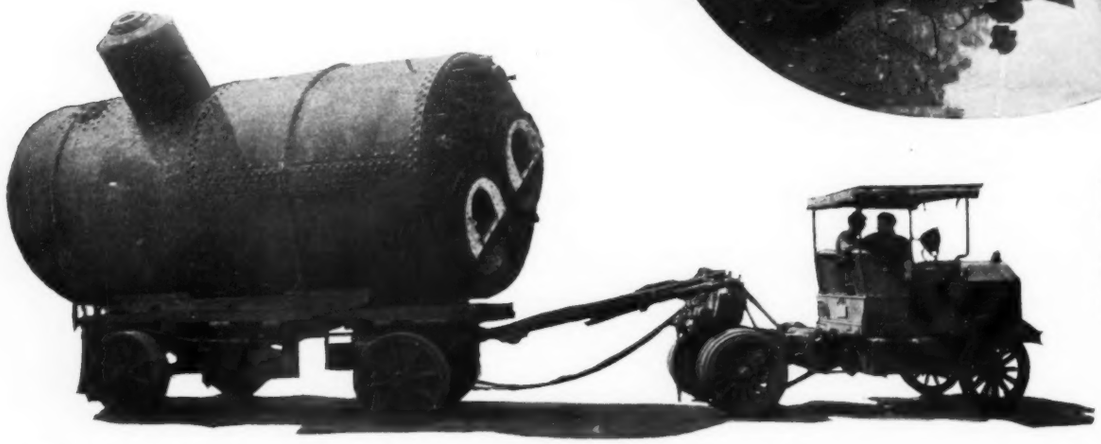
C% = Per cent carbon.
E.L. = Elastic limit.
Elon. = Elongation in 2 in.
Red = Reduction area, per cent.
B.H. = Brinnell hardness.

Feats and Features from Field and Factory



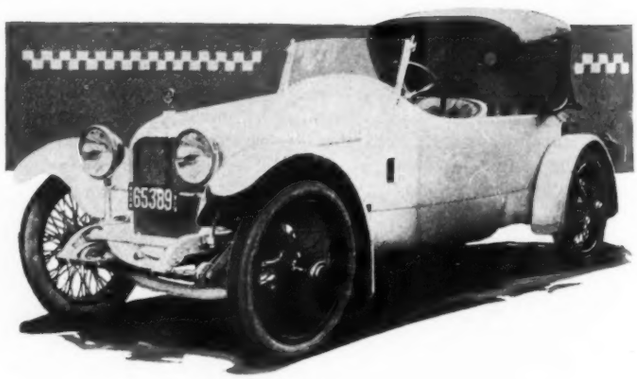
Above is illustrated a testing shed of the Dodge Bros. plant, Detroit, Mich. Solid brick partitions which are practically soundproof form a series of stalls on each side of the center aisle. After the car has been tested on the track it is run in one of these stalls and the tester is able to detect and remedy the faintest knock





Above is a National twelve fording a stream on a field test at the base of Wild Cat Mountain in Tennessee. This is made possible by the high location of carbureter and magneto in the V of the motor

Above is illustrated a Knox tractor which recently moved a 33-ton boiler on an 8-ton wagon from a power plant at Holmsburg, Pa., to the Philadelphia city power plant at Fairmount Park. The total load hauled was 41 tons, although the tractor is rated at 5 to 15 tons capacity



At the right is a special 22-70 Mercer sporting model owned by W. N. Danforth of Boston. The finished but rakish design of this car has attracted great attention throughout New England

At the left is illustrated a test of a Grant six on a 50 per cent grade made at the Chicago sales rooms. The car starts on a runway 24 ft. from the bottom of the incline and then climbs 36 ft. on an 18-ft. standard

Piston Practice*

Present Day Design With Special Reference To Aluminum Alloy

By James E. Diamond

WHILE the aluminum alloy piston has been widely discussed, orally and otherwise, in recent months, rather more emphasis has been placed on the advantages of this type than on its design. The question of piston design in general offers profitable study and I believe its consideration at this time to be particularly appropriate for two reasons:

In the first place, not infrequently in recent months, the hope has been expressed that piston design might be standardized. Possibly, therefore, a setting forth of such differences of opinion relative to piston design as exist among engineers may offer a starting place for a movement looking toward the realization of this agreeable state of affairs. In the second place, such consideration is undoubtedly appropriate on account of the pre-eminence of the Lynite piston made by the Cothias process, a detail of which method involves the use of permanent molds, and to permit the utilization of which process, engineers must occasionally concede minor details of design. Further, it would seem the important position assumed by this new type of piston should warrant a consideration of certain limitations of the Cothias process should any move toward standardized design appear likely of success.

*A paper presented at the November meeting of the Detroit Section of the Society of Automobile Engineers.

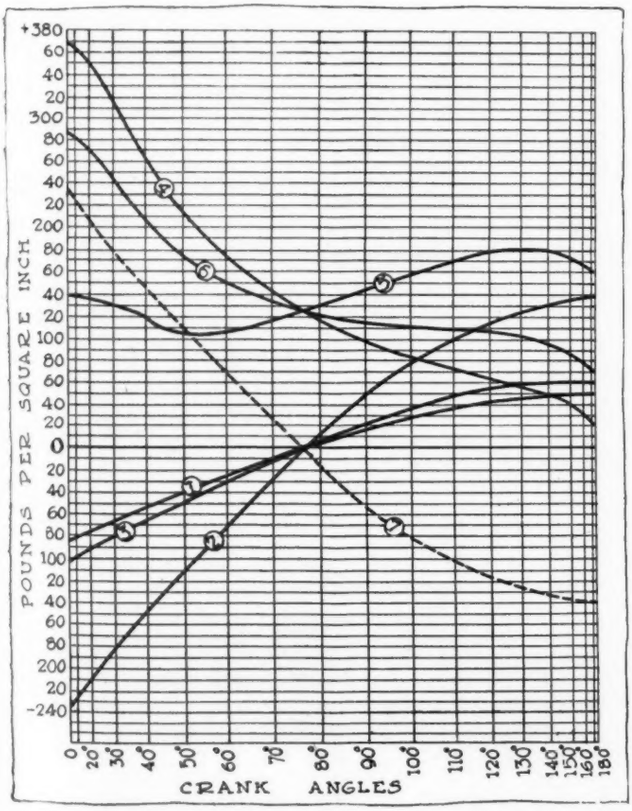


Fig. 1—Average weight, bare piston, per sq. in. of piston head area for Lynite Cothias Process Piston = .0875 lb.
Average weight, bare piston, per sq. in. of piston head area for ordinary cast iron piston = .240 lb.
Various inertia curves for motor with 6-in. stroke, at piston speeds of 1000 and 1500 ft. per minute. These curves for bare piston masses:
(1)—Inertia curve for Lynite piston at 3000 r.p.m.
(2)—Same for cast iron piston at same r.p.m.
(3)—Same for cast iron piston at 2000 r.p.m.
(4)—Assumed expansion gas pressure curve.
(5)—Curves numbers (2) and (4) combined, showing actual piston force.
(6)—Curves numbers (1) and (4) combined, showing actual piston force.
(7)—Combined inertia and exhaust gas pressure curves, iron piston, 3000 r.p.m.

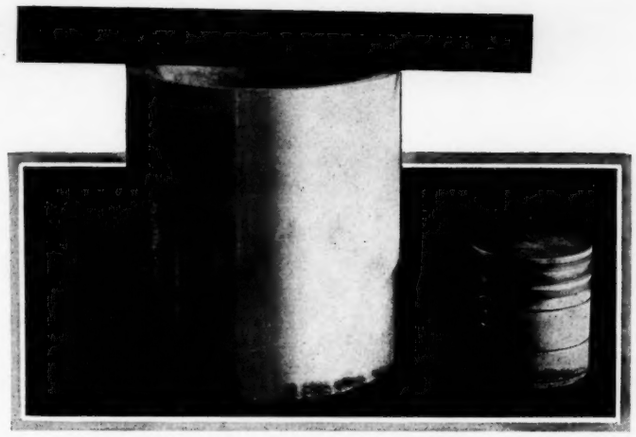


Fig. 2—By way of contrast

However, before entering into an extended consideration of design I venture to comment briefly on some points of superiority of the aluminum alloy piston, first, outlining its advantages generally, then, pointing out wherein the piston made by the process to which allusion has just been made is so much superior to the sand cast one.

Advantages of Alloy Piston

The weight of the aluminum alloy piston is, roughly speaking, but one-third that of a cast iron one of the same design. Therein, of course, lies its fundamental advantage. It naturally immediately follows that the inertia forces attributable to the purely reciprocating mass, by the use of the former, are reduced approximately 60 per cent since the force of inertia is a function of mass and acceleration. It will be recalled that the magnitude of these forces increases as the square of the piston speed, a fact which the advent of the high-speed, long-stroke motor has emphasized as it never before has been. Therefore, there is little need of dwelling on the significance of the reduction of the reciprocating mass, other than to note the marked reduction in the magnitude of the unbalanced forces, the fluctuation of which latter, is the major cause of motor vibration. It follows that the smaller these vibratory forces, the more likelihood that the motor will be able to absorb them within itself, no matter the direction in which acting. Possibly, too, in the past there has been a tendency to underestimate the effect of inertia forces on bearing pressures, but this seems now fully recognized. Quite conceivably, in motors of the type just mentioned, these inertia forces may produce bearing pressures quite comparable with those occasioned by the actual working forces in the motor. Bearing life is a decidedly practical consideration, and to say that decreased bearing pressure will result in increased bearing life is axiomatic.

The incidental advantages of this type of piston are several. The co-efficient of friction of the Lynite piston alloy is but half that of iron. This is significant in two or three ways. In the first place, there must be a gain, however slight, in mechanical efficiency in the motor, and it is these slight gains that the engineer to-day is seeking. Also, the piston side pressure may be increased without unfavorable results. This has a bearing on a type of piston, the design

of which will be later discussed, in which there is some reduction in the bearing area.

The much greater thermal conductivity of the aluminum piston alloy is likewise a factor of no little importance. This greater conductivity variously determined as from ten to fourteen times that of iron, reflects itself in a marked decrease in the amount of carbon deposited on the piston head. In fact under favorable lubricating conditions, there may be a total absence of carbon.

Advantage may be taken of this thermal property in increasing, if desired, in motors of the smaller bores, the compression beyond the point at which preignition would invariably occur with iron pistons. In fact, in one or two cases such advantage has been taken.

Characteristics of Cothias Piston

The piston made by the Cothias process, is superior to the sand cast one in every respect. The point of superiority in which its pre-eminence is most marked—and of the greatest practical worth—has to do with the quality, hardness. The Lynite piston alloy which has rather exceptional qualities even when cast in sand, acquires a hardness fully 25 per cent greater in this process. In fact, its hardness falls not far short of that of the average piston iron. At the same time, it is enough softer than the iron or semi-steel of the cylinder, that in the event of piston seizure, it is the cylinder, and not the piston that does the scoring.

Incidental to this process, additional strength is imparted to the metal, this increase ranging from 20 to 30 per cent. However, this gain in strength is quite secondary in importance to the gain in hardness just noted. I might add, however, that in one particular case, the difference between the sand cast and the piston made by this method, both pistons of identical design, was the difference between failure and success.

Quite aside from the engineering aspects of the matter, this Cothias process piston should, and does, commend itself to the manufacturer. Its advantages from the standpoint of production are quite obvious. As the pistons come from the mold practically exactly round, a finish of but 1/32 in. on a side is all that is required, not more than may be removed by two grinding operations, a rough and a finish. The wristpin holes are also cored, possibly saving one operation, or, if not, at least cutting the machining time in half. Considering now the sand casting this requires rather a liberal amount of excess stock for finish and the wristpin holes are but rarely cored. The foundry must be paid, and quite properly, for this excess metal, and in addition to this now unnecessary expense further expense must be incurred by the extra operations required to remove this same excess stock. As a basis of comparison, I have weighed rough sand castings and unfinished castings of the type being described of similar design, and find the former to weigh between 30 and 40 per cent more. To cite one specific case, the sand casting weighed 1¾ lb., the other but 1¼ lb., a saving of ½ lb. of metal per piston.

Regarding machining, a moment back, grinding was mentioned, such reference being made advisedly, since no difficulty is encountered in grinding the Lynite Cothias process piston, due to the acquired hardness of the metal. Kerosene seems to be the best grinding or cutting compound. As a matter of fact, however, I should judge that the majority of manufacturers prefer to machine their pistons on rapid lathes. With this procedure, fully as large production is being attained, and at less cost, it is stated. In a few instances, these pistons are being burnished, the alloy taking a high polish. This practice has much to commend it.

Difficulties with the Alloy Piston

A consideration of the difficulties experienced with the aluminum alloy piston should by no means be neglected. Fortunately, this consideration may be brief, since the troubles anticipated by most engineers a year ago on account of the relatively greater expansion of aluminum than iron, have not materialized. I would like to mention here that the co-efficient of expansion for iron is 0.0000119 and aluminum 0.000023 per deg. Fahrenheit, about one to two, but the difference is not as significant as might seem to be the case, since the greater thermal conductivity of the aluminum alloy is a factor which plays a part in the actual expansion of the piston.

It is not to be denied that trouble has been experienced in individual cases, but in practically every instance it has been possible to eliminate such trouble. The difficulties have, in the main, been two. Piston slap has been one of them, although as a matter of fact, very little has been said about slap in the last three or four months. The other has had to do with the pumping of oil in high-speed motors, while running at low speeds. This pumping naturally signifies, if nothing else, a larger consumption of oil with the incidental consequence of smoky exhaust and occasional sooty plugs, though these two do not necessarily follow. However, this trouble is by no means confined to the aluminum alloy piston, iron pistons under similar conditions having been known to pump oil; however, the condition is aggravated with the alloy piston, due to the fact that practically none of the clearance allowed for expansion when turning over at high speed has been taken up by the piston body, while on the other hand, with the motor throttled down, the vacuum created by the intake stroke, results in a greatly increased suction in the space between piston and cylinder. Various means of overcoming slap and oil pumping will be mentioned later in the paper.

Incidentally, brief scrutiny of the prints that it has been

Fig. 3—A—Cothias process piston, showing fine ribs possible of attainment with process. B—Racing piston. C—Knight piston—note concave head. D—Piston, 490-hr. run, block test, at speed of 1200-1300 r.p.m., equivalent in mileage 17,000. Wear about 0.00025. E—English hourglass piston. On right—Northway piston.

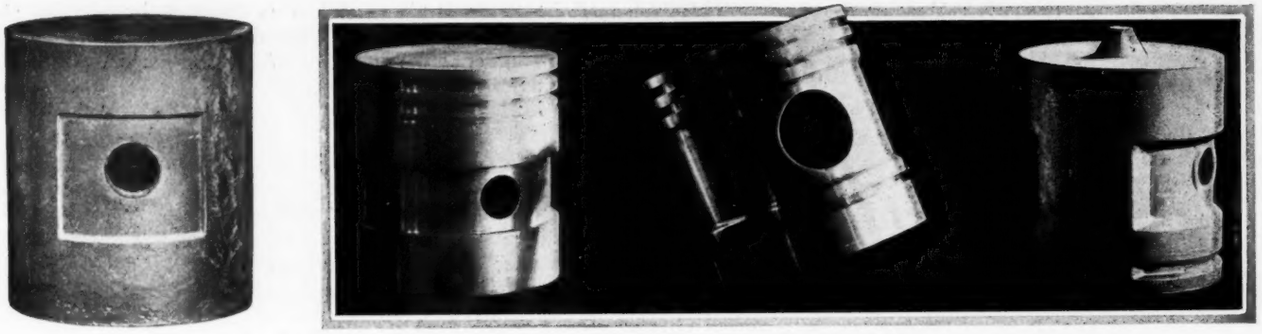


Fig. 4—Left and right—Northway piston. Center—King piston. Note wiping ring is employed

my pleasure to receive, would force home to designers generally the advantage of standardized design. Closer scrutiny would seem to show the possibility of reconciling these various designs. The prints submitted show pistons of fifteen or sixteen diameters, the latter ranging from 2½ to 5⅛ in. and while I feel entirely safe in saying that no two for the same bore motor are interchangeable, at the same time, in many cases, the differences are slight and might easily be compromised. Some of the variations noted will be mentioned. For instance, only one print showing a 2⅝ in. piston was submitted. The head of this piston showed a thickness of 5/32 in.; on the other hand, a piston 3¾ in. diameter calls for a head thickness of but ⅛ in. Similarly, another 3 in. piston calls for a head thickness of 3/16 in., the same as another 4¼ in. piston. There is the same diversity in the size of the wristpin. A small piston has a large one, and vice versa. Some designs make provision for oil drainage. In others there would seem to be none whatever. Another point of variation is in the width of ring used. As frequently as not, the smaller piston has a wider ring. However, tabulation has shown the ring with a width of 3/16 in. to be the most commonly used one for pistons with diameters between 3 and 4 in. In passing, possibly 90 per cent of the blue prints to which reference is being made, show pistons for motors with bores lying within these limits, and the most recently received prints show a decided trend toward the smaller bores. It is interesting to note that this independently made tabulation checks up exactly with the proposed S. A. E. standard for piston ring widths, and which will later be mentioned. The use of three rings seems to be the standard practice. In one or two instances, four rings are employed at the upper end of the piston; in three or four, but two rings. Several designs show the employment of a so-called wiping ring at the lower end of the piston, three rings being used at the upper end. In one case, provision is made for but two rings.

Piston Length Variation

Another point of great variation is that of piston length. A few, in my opinion, fortunately a very few, have a length no greater than the diameter. In one case, the length is less than the diameter. On the other hand, a few pistons have a length nearly one and one-half times the diameter. To mention the dimensions of a piston used in a recently announced model its diameter is 4⅜ in., its length 6 1/16 in., or the length in terms of the diameter is one and thirty-nine-one hundredths (1.39) the diameter. In general, the piston length has been found to vary from one and one-fifth (1.2) to one and three-tenths (1.3) the diameter.

Determination of Head Thickness

Let us consider from the standpoint of theory the conventionally designed piston. I characterize as the piston of conventional design the one employing rings, regardless of number, at the upper or head end only. This arrangement is quite the most common. Most treatises on design resort to the formula of Grashof in the determination of thickness of head, considering the piston head as a circular plate.

Grashof's formula is of the following form:

$$\text{Thickness } t = D\sqrt{\frac{P_m}{6S_p}}$$

Where D equals the diameter in inches, which may be taken as the bore, P_m equals the maximum pressure per square inch and S_p equals the allowable working stress in tension in the metal.

Merriman in his Mechanics of Materials derives a formula of the form:

$$\text{Thickness } t = \frac{3D}{4}\sqrt{\frac{P_m}{2S_p}}$$

For cast iron, S_p with both formulae is given as 3000 lb.

Formula Inapplicable

With one qualification, these formulae, assuming a maximum explosion pressure of 450 or even 400 lb. per square inch, give head thicknesses much greater than is current practice as shown by these prints. Of course it is possible, provided either of these formulæ has been used, that much higher allowable tensile stresses have been assumed than named as safe by the authors. I am inclined to think that most designers in calculating head thicknesses, have considered the problem as simply one in shear, and which I believe is an entirely safe procedure for pistons of diameters no larger than those of automobile engines.

With an assumed maximum explosion pressure of 450 lb. per square inch, and a figure that should provide for the exceptional condition, and an allowable unit tensile stress of 1500 lb.

F being the unsupported diameter of head

$$\text{Thickness } t = \frac{F}{13} \text{ approximately.}$$

Investigation has disclosed the unsupported diameter of head to range between eight-tenths (0.8) and eighty-five hundredths (0.85) the piston diameter, from which, taking the mean, it at once follows that

$$\text{Thickness } t = \frac{D}{16} \text{ approximately.}$$

I will anticipate the question that will possibly be raised, relative to the large factor of safety employed. As is well known, there is a tendency with all metals and alloys to lose a portion of their strength during actual subjection to continued high temperature. As a matter of fact certain aluminum alloys become very brittle under such conditions. The question of immutability under long continued high temperature is a most important one. While we believe we have developed an alloy of a nature peculiarly resistant in this respect, at the same time caution should be the keynote. It should be borne in mind that the melting points of aluminum alloys are much closer to the operating temperatures in motors than is the melting point of cast iron. The slight increase in head thickness given with the factor of safety used, will increase the weight of the piston only very slightly.

From the standpoint of thermal conductivity, a deep rib

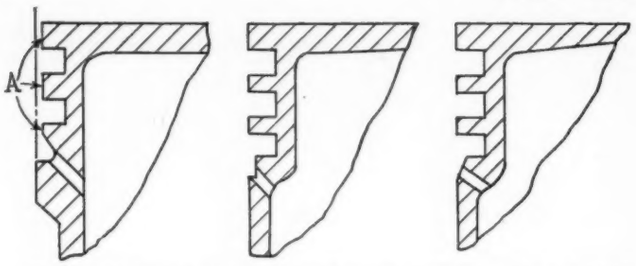


Fig. 5—Right and center—Provision for oil return. Two methods commonly employed shown. Left—Detail of King hourglass type piston showing ingenious oil drainage provision. Note bottom ring is backed by land of full depth, there being no sacrifice of support as in the case where the ordinary relief is employed. Also note all lands ground to same diameter.

or two, across the head, renders material assistance in keeping the piston head cool. The rib in the plane of the bosses may be dropped down to these, giving rigidity to the latter, as well as binding the ring-carrying portion of the piston securely to the lower half. The extension of this rib will permit a slight decrease in the thickness of metal back of the ring groove and it would seem that the pin boss might be of slightly less diameter when supported by a rib. In one or two cases, the objection has been raised that, due to the thermal property of the alloy, this rib carried heat to the one point it was not wanted. However, to my best knowledge, no trouble whatever has developed where this has been done. As an indication of the effect of ribbing, the case of a 5 in. piston is cited. The motor using this particular piston is a high compression one, developing in the vicinity of 175 hp. at about 1500 r.p.m. This piston is exceptionally well ribbed, the transverse rib extending down the side nearly to the bottom of the skirt, and but 0.008 in. clearance is allowed on the skirt. Before ribbing, the clearances necessary were some thousandths greater.

Piston Length

The calculation of the actual length of bearing a piston should have against the cylinder so that a safe working pressure should be exceeded at no time is too involved and would take too much time to warrant its determination here, other than to indicate the factors that enter into the problem. A mean pressure of from 25 to 30 lb. per square inch of projected bearing area is, I believe, not excessive for high speed motors.

Side-pressure is, of course, a tangential function and is expressed by an equation in the form

$$P_s = P \tan \alpha$$

P being the total force exerted by the piston and α the rod angle. The total force is not the gas pressure back of the piston but rather is the sum of such pressure and the inertia force. This latter opposes or is negative for approximately half of the stroke and is positive for the balance. Both, of course, vary with the piston position. It will be seen that the problem really depends upon the "cut and try" method for solution. The combined force must be determined for various crank positions, resolved into components perpendicular to the cylinder and the mean found. Investigation of several cases with the connecting-rod—stroke ratio two or higher has shown that if the actual bearing length is about the same as the piston diameter the mean side-pressure will not exceed the higher figure mentioned a moment since, that is, 30 lb. per square inch of projected area. However, the advantages of the long piston, especially in aluminum, are obvious and if it is possible to increase the bearing length, so much the better. If the length of the piston is always taken as one and three-tenths (1.3) to one and one-third (1.33) the diameter in the conventional three-ring one, the question of bearing length will almost certainly take care of itself.

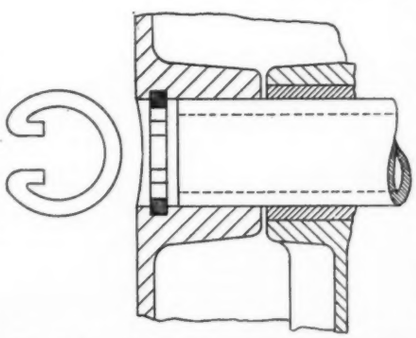


Fig. 6—Provision for preventing pin from scoring cylinder when free to rotate in either rod or piston

Wristpin Location

A detail of design meriting the fullest consideration is relative to the location of the wristpin. This point is approached with some little trepidation owing not to any great divergence of opinion as to its theoretically correct location, concerning which most engineers are, in the main, agreed, but rather because in advocating and urging that theory be put into practice, the question is going to be raised that motor cost will be increased. Undoubtedly, the conflict here between theory and practice is the chief stumbling block in the path leading toward standardized piston design.

In this connection the trend of design as shown by the prints in hand is worth a word of comment. If any conclusion is to be drawn from these prints, it is that many engineers in the last six months have approached this question from a new angle. Inspection of the drawings received prior to this time would seem to show that in the majority of cases the designer has had one or both of two things in mind. Possibly, in some cases an effort has been made to balance the piston about the wristpin. In other cases it would seem that the designer has endeavored to get the wristpin as near the head of the piston as possible, outside construction details apparently influencing him. The prints received showing that bearing considerations had had an influence on the wristpin location were exceedingly rare.

Recently, however, possibly as many as 25 per cent of the prints that have been submitted show that even distribution of side-pressure due to rod angularity has been the dominant consideration in the design of the piston.

Let us analyze the changes necessitated in a motor in changing the design of the piston in such way as to insure uniform distribution of side-pressure. As has just been stated the objection that is going to be raised to the conversion of theory into practice will be on the score of expense, due mainly to the fact that the over-all motor height must necessarily be increased to keep the operating conditions the same. This additional height represents a slight increase in weight, consequently, casting cost; also may increase very slightly the machining cost. There would seem to be no other reasonable objection except possibly in the eight in that it would increase the over-all width to an undesirable point. Especially might this be the case with eights with over-head valve construction. This objection I do not believe, can be raised in the case of the twelve nor in the case of the vertical motor.

As a matter of fact two manufacturers in this section have in their latest models increased the over-all height of their motors to permit the dropping of the wristpin which had formerly been nearer the head, to a point insuring this uniform distribution of side-pressure. The pistons (iron) in these motors were always a source of trouble in that they wore unequally and excessively and slapped badly until this change had been made.

In the consideration of the problem involving the determination of proper wristpin location the forces may be assumed to act in one plane. At first glance it might seem that if the wristpin axis were to lie in a transverse plane dividing the actual bearing portion of the piston cylinder into two equal parts the desired condition would be attained. However this is not quite correct since the friction between piston and cylinder introduces a turning moment about the

wristpin. Then if P represents the uniform mean pressure desired per inch of actual bearing length,

$$\text{Total load } P = (L - l)\, p$$

L being the total piston length and l the non-bearing length of piston. For reasons which are obvious, the rings do not enter into the problem at all. In taking turning moments about the wristpin, μ being the co-efficient of friction

$$p\,(x-l)\,\frac{(x-l)}{2} + \mu\,(L-l)\,p\,\frac{D}{2} = p\,(L-x)\,\frac{(L-x)}{2}$$

Simplifying

$$x = \frac{L+l}{2} - \frac{\mu D}{2}$$

D being the piston diameter.

The interpretation of this is that the proper location of the wristpin should be above the exact bearing center by a distance in inches equal to one-half the product of the coefficient of friction by the diameter. A similar method of reasoning may be used in the location of the wristpin in pistons utilizing a wiping ring. It will be seen the smaller the coefficient of friction, the nearer the center of actual bearing surface, the proper pin location.

Wristpin Bearing Length

Let us now briefly consider the relation of wristpin and piston. The method of locking the pin and rod together, rocking the pin in the piston seems to be gaining in favor and I should judge in approximately 50 per cent of the motors now being built this practice is being followed. It certainly has the advantage of being the cheaper construction and possibly a slightly longer bearing length may be had.

It may be assumed that the maximum load sustained by the wristpin is that caused by the explosion and which it really is when the motor is turning slowly. At high speeds on the power stroke it will not ordinarily be as great due to the inertia of the piston. In checking over a number of drawings this wristpin bearing pressure has been found to range between 2500 and 3000 lb. per square inch of projected area. In a few cases with the maximum explosion pressure figured as low as 400 lb. per square inch it has even been found that the wristpin bearing pressure will attain a pressure as high as 4500 lb. per square inch of projected area of the wristpin.

However, taking the low figure, assuming 2500 lb. per square inch of projected area to be the average figure, if l_w is the total length of bearing, d the pin diameter, D the piston diameter, and P the maximum explosion pressure per sq. in.

$$2500\, l_w\, d = \frac{\pi D^2 P}{4} \quad \text{or} \quad d = \frac{\pi D^2 P}{10{,}000 l_w}$$

l_w may be as high as seven-tenths with sand castings, but is usually limited to five-eighths (0.625) the piston diameter due to conditions surrounding the operation of the molds when the pistons are manufactured by the Cothias process. This has to do only with the case where the pin rocks in the piston.

Again assuming a maximum explosion pressure of 450 lb. per square inch,

$$\text{When } l_w = 0.6D,\ d = \frac{\pi D}{13.3} = \frac{D}{4.25}$$

An empirical formula of the form

$$d = \frac{D}{4} - \frac{1 \text{ in.}}{16}$$

for the diameter in which we are interested checks up very well with the previous one, and is easily solved by inspection.

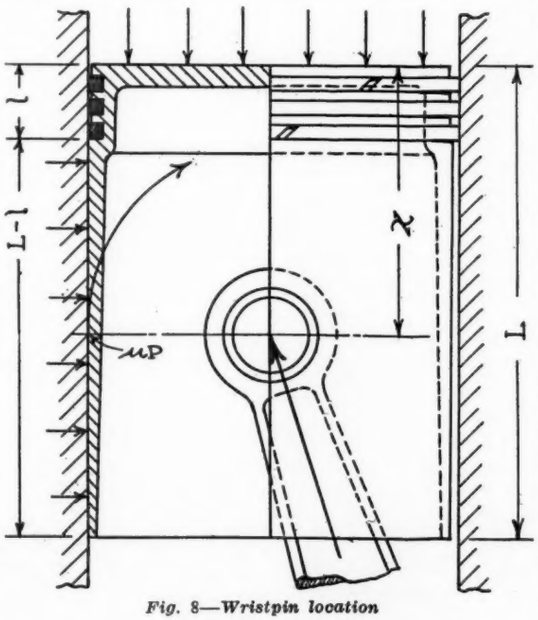


Fig. 8—Wristpin location

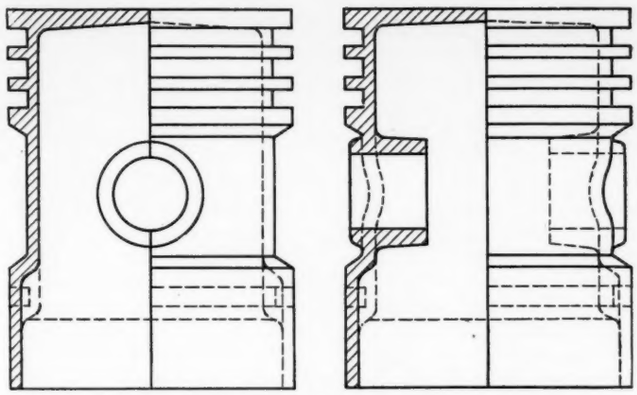


Fig. 7—Sectional drawing of hourglass piston

Occasionally it is possible to get a bearing length equal to sixty-five-hundredths (0.65) the diameter in this process when but one rib in the plane of the bosses is employed. On the other hand, if two ribs are desired a bearing length equal to six-tenths (0.6) the diameter is absolutely the maximum possible of attainment. More to the point, the distance between boss faces is represented by the complements of the percentages previously given; that is, the distance between faces will range from thirty-five-hundredths (0.35) to four-tenths (0.4) the diameter.

Wristpin May Have Wide Bearing

It may be said that up to this time we have experienced no difficulty whatever in retaining the specified width between bosses in the type of piston in which the pin is locked in the piston, in the manufacture of pistons by this process. In some cases connecting-rod bearing length as high as seven-tenths (0.7) the diameter has been secured.

Limitation of the Cothias Process

The wall of the Cothias process piston from the bosses down should be somewhat thicker than that of the iron piston since this process as presently developed does not permit the production commercially of pistons with the internal flange incorporated for stiffness at the bottom of the skirt. In explanation may be pointed out the fact that this process in the present art requires that the diameters of the piston increase progressively from the diameter at the head end, that is, the internal diameter of the ring carrying portion, to permit the withdrawal of the core. It is also necessary that slight allowance for taper be made. Examination of the various pistons we have made shows that the wall thickness of the finished piston will average from 3/32 in. for a 3 in. piston to ⅛ in. for a 4 in. one.

The Oil-Pumping Problem

Relative to some of the minor details of design a large number of the piston drawings show an oil groove back of the last ring with drain holes into the interior of the piston. I believe that experience has shown these drain holes should be at least 3/32 in. diameter to function properly, this regardless of the size of the piston. This provision for oil drainage is most important in the aluminum alloy piston where the clearances are neces-

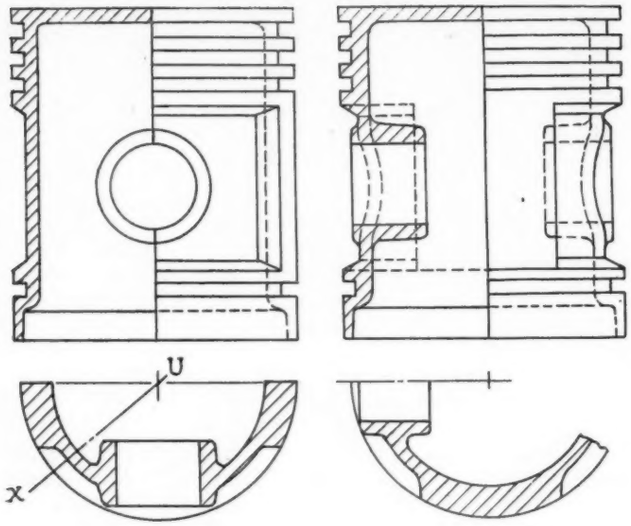


Fig. 9—Adaptation of hourglass type shown in section

sarily greater than with the iron one, the oil film being consequently heavier, since, this excess oil must either drain back into the crankcase or be pumped into the combustion chamber. Possibly the piston side-pressure causes a squirting action in addition.

In any event, as was mentioned some time back, in the case of several high speed motors where it has been found necessary to allow excessive clearance for the reasons given, it had been found most difficult to eliminate pumping of oil while running slowly, until this recess with drainage holes was incorporated in the piston.

Certain motors, however, due to the method of lubrication used, have required the employment of a wiping ring in the piston, to eliminate oil pumping. Incidentally, the use of a wiping ring, at least in all cases I have observed, has had a salutary effect on piston slap, even although in some cases the clearances have been unnecessarily great and slap should naturally have been expected. The "lag" of the piston due to friction in the ring groove, would seem to be the natural explanation for this agreeable condition.

The Hourglass Piston

In this connection since the results had with it have been quite remarkable insofar as the elimination of oil pumping is concerned, I would like to refer brefly to the hourglass type of piston. This type of piston was developed in Europe and its use has become more or less general on the Continent. At the present time pistons after this design are being employed on the Minerva, Clement and the Delage. As a matter of interest the pistons in the Mercedes 1914 Grand Prix winner were of this type. Two manufacturers in this country have recently completed a series of exhaustive tests with this type piston with such highly satisfactory results that it has been adopted as standard in their 1916 motors. In these two particular pistons, wiping rings are not employed, and the design has accommodated itself well to our process. This hourglass type of piston, in the main, is particularly well adapted to the Cothias process, and may very well include a wiping ring. It will be understood that for the same reasons that prevent the inclusion of an internal flange at the bottom of the piston, we are not able to include a flange to contain a wiping ring, at the same time maintaining an economic section. In other words, unless recourse is had to the hourglass type it is not possible for us to produce a piston with provision for wiping ring without sacrificing the fundamental advantage of the aluminum alloy piston, that is, lightness.

The general hourglass design may very easily include a wiping ring with a very slight, if any, increase in weight. The objection has been raised that bearing surface is being sacrificed. To provide additional bearing surface about the point where the side thrust is most direct, the Northway engineers have designed a piston in which the retraction is not carried the complete circumference, in effect bridging the gaps at the above locations. This Northway type has created much favorable criticism and several different pistons of this adaptation are now being produced.

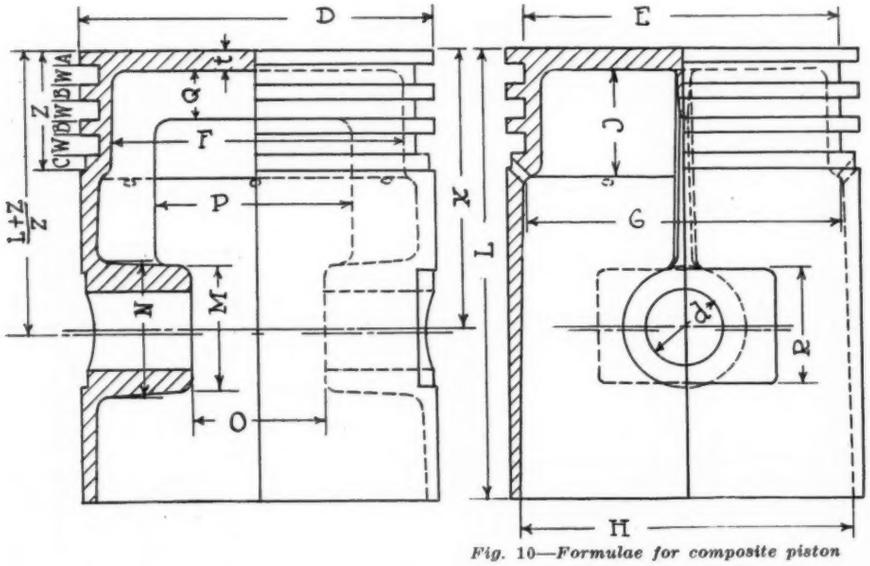
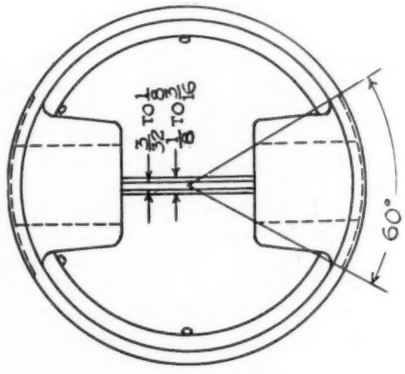


Fig. 10—Formulae for composite piston

Ring Widths

Nominal Diameter		Width
2"	—2½" inclusive	¼"
2⅝"—4"	inclusive	3/16"
4⅛"—5"	inclusive	¼"
5⅛"—6"	inclusive	5/16"

Proposed S. A. E. standard for piston rings and grooves



Key

A	*Width of first land*	=	$D/16 - 1/16"$
W	*Ring width*	=	*See table*
B	*Width of second and succeeding lands*	=	$D/16 - 5/64"$
C	*Oil groove*	=	⅛" wide × 1/32" deep
D	*Piston diameter*	=	
E	*Diameter bottom of ring grooves*	=	$D - 1.7\,W$
F	*Diameter of ring backing*	=	$7\,D/8 + ⅛" - 1.7\,W$
t	*Thickness of head*	=	$D/16$
G	*Internal diameter top of skirt*	=	$15/16D - 1/16"$
H	*Internal diameter bottom of skirt*	=	$15/16D$
I	*Non-bearing piston length*	=	
L	*Piston length*	=	$1.3\,D$
J	*Depth inside of head of ring carrier*	=	$D/8 + 3W - 3/32"$
X	*Distance from head to wristpin center line*	=	$\frac{L+1}{2} - \mu D/2$
O	*Distance between boss faces*	=	$0.375D$ *to* $0.35D$
M	*Diameter small end of boss*	=	$⅝\,D - 1/16"$
N	*Diameter large end of boss*	=	$⅝\,D$
d	*Diameter of wristpin*	=	$D/4 - 1/16"$
P	*Opening of rib*	=	$O + ½"$
Q	*Depth of rib*	=	$D/8$
R	*Width of relief*	=	$D/3$

If the width of the pad is made one-half the diameter, it follows that one-half the projected area is at least retained, while at the same time weight is being saved on two-thirds of the diameter. In laying out various sizes of pistons of this adapted design, I have found the sacrifice of bearing area to approximate 30 per cent. It must be borne in mind that even with this decrease in bearing surface, the friction load is still going to be less than for an iron piston with 100 per cent bearing on account of the difference in coefficients of friction. The sacrifice in thermal conductivity is even less in proportion to that of the iron piston.

Another matter is relative to wristpin hole relief. I believe it is now universal practice to relieve the piston at this point to provide for boss distortion. Ordinarily, this relief may be cast in the Cothias process piston, saving an expensive machining operation.

The Design of a Composite Piston

It occurred to me in the preparation of this paper that the prints in hand offered much interesting data. Therefore, I have gone over these, compiling data relative to the various details of design and in connection with the questions of design previously discussed, have worked out what might be termed a composite piston, at the same time bearing in mind when designing this, the limitations of the process. However, after all, this has not affected the design of this composite piston very much. Since nine out of every ten piston points received show pistons between 3 and 4 in. in diameter only those prints showing such pistons have been considered. The compiled data have been disregarded in no respect in laying out this piston. However, the length has been laid out on the basis of one and three-tenths (1.3) the diameter rather than one and one-fifth (1.2) as shown by the compilation. I felt warranted in making this change since a great many of the prints submitted were for iron pistons and as has been previously pointed out the greater the length the better it is for the alloy one.

The proposed standards for ring widths have been included. I procured the desired information from the Standards Committee but understand that no formal proposal has yet been made to the members of the Society.

Unfortunately, there does not seem to be any general agreement relative to ring thickness and I have therefore inspected these prints and have tabulated the data relative to the groove depths for rings of the widths on which it is proposed to standardize. This tabulation shows the groove depth to range between eight-tenths (0.8) ring width and eighty-five one hundredths (0.85) ring width. I have taken the higher figure, since I have had no means of knowing whether the rings were eccentric or concentric, and apparently, if the groove depth is the higher percentage, ample provision is made for the eccentric ring.

Further Discussion of C. S. Crawford's Paper on Eight

By Allen Loomis

Research Engineer, Packard Motor Car Co.

EDITOR THE AUTOMOBILE:—As C. S. Crawford's interesting and able paper on Characteristics of the Eight-Cylinder Engine was not given out until the meeting, when the reading was necessarily rapid and time for consideration limited, divers mathematical errors in it escaped attention and are printed in THE AUTOMOBILE for Nov. 4. The following corrections are submitted:

The figure of 70 lb., given near the middle of the first column of page 841, as representing the maximum unbalanced force at 1000 r.p.m., was, at the meeting, changed by Mr. Crawford to 140 lb. I remarked at the time that this implied a reciprocating weight in each cylinder equal to only 1 lb., 9 oz.; but not until after the meeting was my attention called to the figure of 2.375 lb., given in Table II. A proper calculation based upon this would correct the figure originally printed in the paper by substantially trebling it instead of merely doubling it, as admitted at the meeting. I hereby submit the calculation in abridged form.

The distance X through which the combined center of gravity of reciprocating weights in one side of the motor moves, as indicated in Fig. 6 of Mr. Crawford's paper, is found by computation to be 0.274 in.

As has been pointed out previously in the deliberations of this society, the combined center of gravity of all pistons in a 90-deg. V-type, eight-cylinder motor moves in a horizontal path through a distance equal to the distance X multiplied by 0.70711. This motion is harmonic and the complete double vibration occurs twice during each revolution of the crankshaft.

The maximum accelerating force in harmonic motion is equivalent to the centrifugal force of the same weight revolving uniformly in a circle whose diameter equals the length of the harmonic motion, in the same period of time required for the complete double vibration.

The radius, R, of this circle $= \frac{0.274 \times 0.70711}{2 \times 12} = 0.008073$ ft.

At 1000 r.p.m. of the crankshaft, or 2000 r.p.m. of the point under consideration, the linear velocity, V, of the point equals:

$$2 \times 0.008073 \times 2000 = 101.45 \text{ ft. per min.}$$

or

$$1.6908 \text{ ft. per sec.}$$

The vibrating weight, W, equals

$$8 \times 2.375 = 19 \text{ lb.}$$

Substituting these quantities in the ordinary formula for centrifugal force, $\frac{W V^2}{g R}$, in which g equals approximately 32.2, we find that the horizontal vibrating force in the Cole eight motor, at 1000 r.p.m. amounts to 209 lb. At 2000 r.p.m., this force equals 836 lb.

These figures greatly modify the resultant curves given in Figs. 4 and 5 published with the paper. The vibrating effect cannot be ignored either when one considers theoretically but properly that this force acts upon only one end of only the unsprung weight of the car, or when one actually compares the impressions obtained by riding in the tonneau of an eight-cylinder car and in the tonneau of a well-built twin six.

Even up to the present I have not had time to check all the computations in the paper, but wish to call attention to the obvious error in the computation of unit inertia pressure per square inch of projected area of crankpin given by the author in Table 7. The author has apparently taken into consideration the inertia effect of only the reciprocating parts of only one cylinder. It is obvious that the total inertia forces acting upon each crankpin of the Cole eight motor are actually due to the reciprocating parts in two cylinders plus the revolving weights of the connecting-rod big ends. The weight of the connecting-rod big ends is not now at hand, but it is probable that when the forces alluded to are properly combined, the unit inertia pressures for the motor will be found to be approximately treble those given in Table 7 of Mr. Crawford's paper.

The FORUM

SAND CASTING ARGUED FROM A FRESH VIEWPOINT—WHY PHOSPHORUS AND SULPHUR CONTENT S. A. E. STEELS IS NOT CHANGED—HOW SHOULD THE GNOME ENGINE BE CLASSIFIED?

Phosphorus Sulphur Content of S. A. E. Steels

EDITOR THE AUTOMOBILE:—On behalf of the Standards Committee of the Society of Automobile Engineers may I ask that you present a correction of one point in your very excellent report of the Chicago meeting in your issue of Oct. 21? On page 736 the statement was made that the suggestion will be given to the society next winter of raising the limits for phosphorus and sulphur in steel to 0.045 and 0.054 per cent respectively. As a matter of fact, the phosphorus and sulphur contents of the carbon steel grades up to those containing 0.45 per cent carbon were raised to 0.045 and 0.050 per cent respectively in January, 1914, and no change in these elements is proposed either for the carbon or alloy steels at this time.

In continuing the work of the iron and steel division, it has been the desire to take recognition in some way of the higher grades of steel which are demanded by some manufacturers for certain particular parts and the division has considered the listing of a separate schedule for this purpose. Since, however, the grades listed at this time are, in the opinion of the division, thoroughly adequate for the production of the great majority of structural parts and since the introduction of a separate list with no variant except in phosphorus and sulphur would probably have the effect of complicating our list, the action proposed at this time, to cover the situation, is to introduce in the text of our specifications a statement equivalent to the following:

"The compositions listed below include practically all the steel materials necessary for the great majority of automobile parts. In cases where very special duty or exceptional quality is demanded, grades containing less phosphorus and sulphur are available, but these should be made the subject of special agreement between buyer and seller. By such arrangement, manganese may also be limited within a variation of 0.20 per cent inside the limits given."—K. W. ZIMMERSCHIED, Chairman, Standards Committee, S. A. E.

Advantages of Sand-Cast Pistons

By W. M. Levett

President Walker M. Levett Co.

EDITOR THE AUTOMOBILE:—The fact that all of the American cars entered at the Astor Cup race were equipped with Magnalite sand-cast pistons, seems to have aroused much comment and it may be of interest at this time to give you some further facts relative to sand-castings for piston requirements.

As piston discussions have proved a rather important part in your Forum on the increased use of aluminum and aluminum alloys for automobile construction, the types and designs of alloy pistons which have met with the greatest success should prove of interest to your readers, especially in view of the agitation now on as to the comparative merits of sand and die castings.

We do not concede that a die-casting made under the conditions necessitated by the die-casting process will show as close a grain or as much strength as a sand-casting. The conditions of manufacture to which the aluminum alloy is subjected in the die-casting process result in impairing the vitality of the metal because of reasons readily understood by the foundryman.

Comparative examination will prove that our sand-cast Magnalite metal has more density and strength than that of the die-cast piston as commercially manufactured. As a matter of fact, our experimental department has made an examination of some die-cast piston samples by comparative tests and we have found the metal in these to show really not so great tensile strength as in our sand-cast pistons.

No Piston Trouble in Astor Cup Race

Of the eight cars to finish at Sheepshead Bay, only one—the sixth—was not equipped with sand-cast pistons of our metal and this car we understand was equipped with steel pistons. Among the foreign cars, many of which, we understand, used pistons machined from the solid steel billet, the principal trouble which eliminated them seems to have occurred in the form of broken connecting-rods or crankshafts, a condition which would indicate that the reciprocating parts of these motors were not of sufficiently light weight construction to stand the terrific strains of the 102-mile pace which was established.

Of the American cars eliminated—all of them, as stated, were equipped with Magnalite sand-cast pistons—we were unable to learn of a single one going out of the race because of engine trouble in this form. The results at the Astor Cup race, as far as sand-cast aluminum alloy pistons are concerned, is simply a repetition of the showing that has been made throughout the racing season. It might almost be said that this season's racing offered competitive contrast solely between our pistons and those in the foreign cars machined from solid steel billets, as with only rare exceptions, have other pistons been used in races of importance. Out of thirty-nine cars equipped with our pistons, which participated in twenty-five races during the season, seventeen have taken first place, seventeen second place and five third place—a condition which would certainly prove beyond any question, the toughness and durability of this metal for racing cars.

The writer examined a steel piston and connecting-rod from a Peugeot which came to grief in the Astor Cup races and found a condition in which the piston wristpin and connecting-rod were battered and bent to an amazing degree ascribed by the driver to excessive heat. Such a condition has not arisen and would not arise with the use of Magnalite parts, owing to the high thermal conductivity of Magnalite.

As for the castings themselves, there can be no question but that by means of a properly made sand core, a much

more substantial and practical system of ribbing is permitted than with the die-cast pistons. The special form of ribbing under the dome of the piston which we have worked out for racing cars, would be impracticable in any type of die-casting now used, and yet experience has shown this ribbing system to be an essential where extremely high speed of the engine and increased strength in the dome of the piston are absolute necessities.

The die-caster has endeavored to compensate for the lack of sufficient ribbing in die-cast pistons by increasing the section of the wall and head, but is he not by so doing throwing away a part of the very advantage sought by the use of aluminum alloy pistons, *i.e.*, a light weight piston?

To sum up—where tough, durable piston metal, where the use of the most advantageous ribbing, where the lightest possible piston is desired, sand-cast pistons must be used.

What Is a Rotary Motor?

By Edward V. Hartford

President Hartford Suspension Co.

EDITOR THE AUTOMOBILE:—Heterophemy, the using of one word when we mean another, is really one of the commonest mistakes in this world of error. I am led up to this remark by a curious example of heterophemy that occurs on page 706 of your issue for Oct. 14, where Charles Vivier, in a very able article on pistons and connecting-rods, calls the Gnome motor, a "rotary motor." Now, the Gnome engine is certainly not a rotary engine, in the same sense that a steam turbine is a rotary engine. A steam turbine usually consists of two parts, stator and rotor. The first is stationary, and the latter in rotary motion. The Gnome type has also a stator and rotor; the crankshaft is the stator and the remainder of the engine is the rotor.

The Gnome engine, however, is also a reciprocating engine, for notwithstanding the fact that they rotate, they have within themselves, pistons which reciprocate in the cylinders. Every mechanic will readily perceive that unless these pistons reciprocate, such a construction called a rotary engine, would, therefore, not be a prime mover; for they would be locked in such a situation—hence, it is obvious that no engine, with reciprocating parts may be called a rotary engine. The Gnome engine has reciprocating parts, and therefore, it is not a rotary engine. Nevertheless, it is hardly fair to call it a reciprocating engine, because that term has been so well standardized, and I believe that the best phrase to use, as indicated by the Editor of *Power* and the Editor of the *Scientific American*, would be to call them rotative engines, in which "the reciprocating motion of the piston is transformed into a continuous rotary motion."

In conclusion, I wish to state that I simply write, because a technical journal should be careful of how it picks its technical terms and expressions, and if this phrase "rotary engine" is once applied to the Gnome motor, it will stick very hard indeed and make it very difficult to eradicate this false impression from the minds of not only the trained engineer, but of the layman as well.

—The only truly descriptive term that has been suggested is "stationary crankshaft engine" but this is too cumbersome for general use. "Rotary cylinder engine" is another suggestion but this offers opportunity for confusion also. Perhaps "fixed crank" would be a possible solution of the difficulty, but any other suggestions would be interesting.—[ED.]

Rhode Island's Registration Analyzed

AN analysis of the registrations of automobiles and motor trucks in the State of Rhode Island up to Oct. 1 shows a total of 14,017 vehicles in use. These are the products of 243 manufacturers, a large number of whom, of course, are no longer active in the car and truck-building field.

Owing to the fact that a number of vehicles are registered under their trade name where the manufacturer makes both passenger cars and trucks it is impossible to tell exactly the number of each. However, counting each of these manufacturers as passenger car producers only, there are 215 of these represented as compared with twenty-two truck builders and six makers of electric cars. On the same basis there are 13,888 passenger cars, seventy-one motor trucks and fifty-eight electric machines.

Going by the number of cars of each make registered Ford leads with 4413, Cadillac being second with 1070, Overland third with 817 and Buick fourth with 719. Then come Packard with 394, Studebaker 388, Maxwell 365, Reo 319, Chalmers 307, Hupmobile 303, Hudson 254 and Pierce-Arrow 249. There are twelve other manufacturers who have over 100 cars each registered, the other 219 varying from Peerless, with 99, down to a large array with but one vehicle.

Car	No.
Ford	4413
Cadillac	1070
Overland	817
Buick	719
Packard	394
Studebaker	388
Maxwell	365
Reo	319
Chalmers	307
Hupmobile	303
Hudson	254
Pierce-Arrow	249
Stevens-Duryea	176
Mitchell	161
Pope	158
Marion	143
Metz	133
Stanley	128
Franklin	122
Oldsmobile	122
Autocar	118
Regal	116
Stoddard-Dayton	110
Rambler	108
Peerless	99
Locomobile	97
Saxon	79
Fiat	77
Paige	75
Cole	69
Renault	68
Premier	65
Knox	61
Winton	58
Jackson	56
E. M. F.	55
Dodge	53
Oakland	52
Velie	43
White	43
R. C. H.	42
Stearns	42
Chevrolet	41
Mercer	41
American	37
Haynes	36
Alco	35
Corbin	35
Thomas	34
Mercedes	33
Stutz	32
Selden	31
Simplex	31
Special	31
Lozier	30
Elmore	29
Jeffery	28
Speedwell	28
Carnation	27
†Baker	26
Columbia	25
Flanders	25
International	25
Inter-State	25
Krit	25
Warren	25
Everitt	24
Lenox	24
Marmon	24
Scripps-Booth	24
Crow-Elkhart	23
†Waverley	23
National	21
Abbott	20
Kissel	20
S. G. V.	19
Briscoe	17
Delaunay	17
Empire	17
King	17
Chandler	16
Garford	16
Pullman	16
Cartercar	15
Herreshoff	15
Lexington	15
Case	14
*Chase	14
Imperial	13
Little	13
Palmer-Singer	13
Partin-Palmer	13
*Federal	12
Michigan	12
Pilot	12
Brush	10
Cutting	10
Northern	10
Crawford	9
Auburn	9
Grout	9
Royal	9
Mora	9
*Mais	9
Courier	8
Detroiter	8
Lancia	8
Moon	8
Nyberg	8
Apperson	7
Auburn	7
Lambert	7
Panhard	7
Pennsylvania	7
Rolls-Royce	7
Sears	7
Vim	7
Allen	6
Bailey	6
Bergdoll	6
Bollée	6
Rainier	6
Trumbull	6
Crown	5
Gaeth	5
Henderson	5
Herff-Brooks	5
Lyons-Knight	5
Westcott	5
Crane	4
DeDietrich	4
*Koehler	4
DeDion	4
Metallurgique	4
Marquette	4
Middleby	4
Marathon	4
Pathfinder	4
*Sampson	4
*Standard	4
Alpena	3
Amplex	3
†Anderson	3
Argo	3
Berliet	3
Brown	3
C. G. V.	3
Clement	3
*G. M. C.	3
Grant	3
*Kelly	3
Matheson	3
Nance	3
Ohio	3
Parry	3
†Rauch & Lang	3
*Republic	3
Welch	3
Zedal	3
Atlas	2
†Babcock	2
Bugatti	2
Cleveland	2
Croxton	2
Daimler	2
E. V. C.	2
Hotchkiss	2
Houpt-Rockwell	2
Isotta	2
Keeton	2
Monroe	2
*Morgan	2
Midland	2
Moline-Knight	2
Napier	2
Orson	2
Owen	2
Queen	2
Racine	2
S. P. A.	2
St. Louis	2
*Sternberg	2
Schneider	2
Vaughan	2
Acme	1
Arbenz	1
Argyll	1
*Available	1
*Bessemer	1
Brasier	1
Cameron	1
Chadwick	1
Charron	1
*Commerce	1
*Compound	1
Continental	1
Correja	1
Crest	1
*Decatur	1
DeTamble	1
Edwards-Knight	1
Enger	1
Flagler	1
Gt. Western	1
†Grinnell	1
Healey	1
Hollier	1
Holsman	1
Itala	1
Keystone-Drilly	1
*Lauth-Juergens	1
Kline	1
Lewis	1
Lion	1
*Mack	1
McIntyre	1
Minerva	1
*Modern	1
Mors	1
Orient	1
Paterson	1
*Piggins	1
Peugeot	1
Reading	1
Rochet-Schneider	1
Russell	1
Saginaw	1
Shaw	1
Shawmut	1
Service	1
Stuyvesant	1
Taft	1
Twombly	1
*Universal	1
*Veerac	1
Vera	1
Vauxhall	1
Vulcan	1
Weaver	1
Willys-Knight	1
Wayne	1
Westinghouse	1
Woods-Mobilette	1
Total	14,017

* Truck. † Electric.

The History of the American Automobile Industry

Third Installment of the Complete History of the Industry in America, Taking Into Account Its Antecedents in Europe —Complete History To Be Published Later in Book Form

This Week the Development of the Steam and Electric Vehicle and the Good Roads Movement

By David Beecroft

ANOTHER brilliant American inventor, John Fitch (1743-98), originally a prosperous jeweler and watchmaker at Camden, N. J., took up the manufacture of arms during the Revolutionary War at Bethlehem, Pa., and designed a steamboat in 1775-6. He built a model in 1785 and a full-sized boat in 1788, which was tested on the Delaware from Trenton to Burlington, making a speed of about 8 m.p.h. and doing as much as 80 miles in a single day. This boat was propelled by vertical paddles operated by a crankshaft, the upper end of the paddle being in a guide and the blade traveling an elongated elliptical path as it moved backward in the water and forward over it. That it was not continued in use and others made was no fault of the mechanism or of the maker, but solely because conditions were not satisfactory at that time.

Early Steamboat Construction

In 1804 William Stevens, of Hoboken, built a boat which was capable of traveling 8 m.p.h. and which was operated for a few weeks. This boat employed a boiler having copper tubes, although we do not know whether this was a distinct invention or whether he knew of the tubular boiler invented by Read a dozen years before. Many people believe that Fulton took advantage of Stevens' work and embodied it in his successful device of 1806, but although it is quite certain that Fulton knew of Stevens' efforts, it is also certain that Fulton was abroad while Stevens was doing his work and that Fulton had plans for a submarine in 1793 and that he tried to interest foreign nations then at war in them, that he published books or pamphlets describing them about 1796 and as late as 1801, and made experiments at Havre and Brest in 1803. Fulton's success must, therefore, be considered as due to finding the right condition rather than to any superior mechanical ability or to his making use of any rights belonging to others. Too often this has been the history of pioneers, and it is a disgrace to modern methods that even now we allow much talent to go unrecognized, seeking helplessly for the assistance and opportunity, that, properly aided and directed, could do much toward making the world better and richer.

With the passing of the year 1800 in America the seeds of motor transportation had been scattered and if the progress was slow from that date up to 1880, when the period of steam automobiles with which we are all familiar began, it was due to a variety of conditions. Population was sparse, roads did not exist in many places, and there were diversions of interest. The practical steamboat was demonstrated in 1804; railroads were started in America in 1809; the hot-air engine was receiving attention; in 1832 the first street car was operated in New York City by horses; in 1837 the electric boat was demonstrated, and in 1842 the first electric locomotive demonstrated what it could do.

Thus, beginning with 1800 began a period of diversity of energy in solving mechanical transportation. The field was not left open to steam, and what steam possessed was divided among the steamboat, railroad and the steam road vehicle.

From 1800 to 1880 the thread of steam development in America is a difficult one to follow, lapses of years passing without any definite record of progress. It will be necessary to introduce both boat and railroad progress in steam at times in order to get the proper perspective of the steam road vehicle through these years of evolution—years in which progress was materially retarded by the absence of roads and years in which the road vehicle was lost sight of by many, due to the faster development of steamboats and railroads.

The Use of Rails

The use of rails in lieu of good roads is much older than the locomotive on rails for it must have been very early apparent that wheels could be assisted over bad roads by laying down rails of some sort. On the other hand, this use could not have been very common because of the lack of suitable rail material. The first record of railways in America indicates that Thomas Leiper, near Ridley, Delaware County, Pa., laid about a mile of track in 1809 to move stone from a quarry. Part of this track was exhibited at some sort of gathering July 31 of that year.

Some claims were made that Silas Whitney had a similar short stretch of railway at Beacon Hill, near Boston, 2 years earlier. It must not be sup-

posed that these rails resembled present railway rails; they were most likely wooden logs hewed to furnish a flat surface, and mortised together at their ends. Because these wooden logs wore out unevenly and were short-lived at best, they were at a later date commonly covered with iron strips on which the wheels ran. These iron strips, at first cast but later of rolled material, resting on the soft wood, would bend more or less as the wheels rolled over them, and eventually break. Frequently their retaining spikes became loose and permitted the ends to rise and become entangled with the vehicle overhead. We therefore see in these inferior constructions another reason why conditions were so difficult for the inventor and progress so slow.

To establish a chronological comparison with railroading in England, the first locomotive was tried on rails in England in 1784 while in 1788 Symington, having abandoned his road carriage model, made a small model steamboat which he tested on a small English lake. In this same year Robert Fourness and James Ashworth obtained a patent on a traction engine for drawing other vehicles. It is not known whether this device was actually built or not, but it is interesting as showing a three-cylinder, vertical, non-condensing engine. Many others were undoubtedly working on the problem at this time and each contributing their small part toward the final success.

Development of American Roads

The reason for road locomotion in America dropping far behind that of Europe, particularly in England and Scotland, was because of the road movement being far behind in America. A brief comparison of road activities is necessary here.

The rapid development in European roads started a movement in America. Congress in March, 1806, appropriated $30,000 toward the surveying and construction of a road from the Potomac, near Cumberland, Md., to the Ohio at Steubenville, Ohio. The length first opened was 130 miles and cost $1,700,000. The first horse stage coach carrying United States mail from Cumberland to Wheeling passed over this road in August, 1818.

How to raise money for these expensive roads was a considerable problem not only in the United States, a country of large distances and little wealth, but even in England, and one of the solutions of this financial problem was the giving of franchises to private corporations which were permitted to construct roads and charge toll for their use. The toll system was probably at first a form of brigandage and is mentioned by the Historian Strabo as existing on roads leading from Babylon to Syria. Many present-day road users can testify that it has not lost its ancient character. In 1346 the toll system was adopted definitely as a means of raising revenue for road maintenance and repair in England, but not until the latter eighteenth and early nineteenth century period did the toll system for raising road revenue become really popular. It rapidly grew, until 1838 showed fully 1100 turnpike trusts existing in the Kingdom. The cost of collecting tolls, however, often nearly equalled the income, and the census of 1871 showed 5000 collectors in England and Scotland. In 1857 Ireland freed herself from toll gates and in 1878 Parliament abolished tolls in England, but this archaic system still exists in some of the older and less progressive parts of the United States.

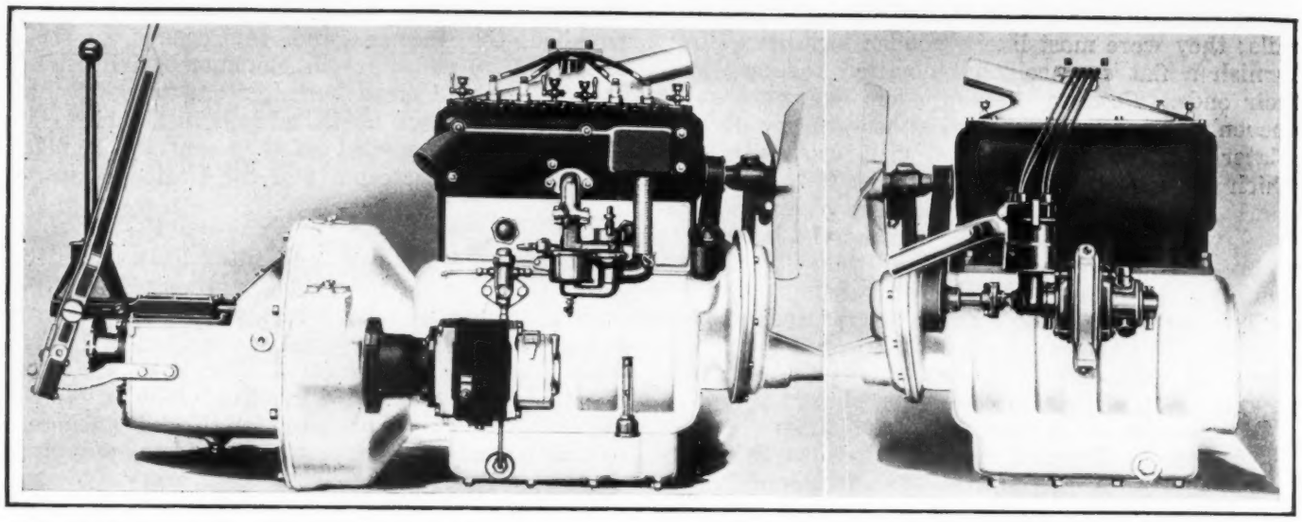
Lancaster Pike First Toll Road

The first toll road in the United States was the Lancaster pike, 62 miles long, authorized in 1792, and still collecting tolls; a monument to permanent private franchise. By 1811 more than 300 turnpikes had been chartered in New York and New England with a combined length of 4500 miles. In 1828 over 3100 miles of chartered turnpikes existed, of which over 2380 miles had been completed at a cost of nearly $8,500,000. The advent of the locomotive and transportation on rails soon after attracted the attention of the American public and the American road was left to itself. Even the great national highway, originally planned to reach St. Louis, vanished in a more or less incomplete end on the prairies of Illinois. This short account of the early roads accentuates the interdependence of the good road and the motor vehicle and partly explains why the second decade of the last century showed so little activity in the motor vehicle field.

Compared with America the road movement in Europe was immeasurably stronger. In fact, roads were the most potent influence in stimulating the development of the motor vehicle.

France was really the leader of the modern road movement, some 15,000 miles of hard road being built by enforced peasant labor under Colbert, who was appointed comptroller of finance in 1661. The present French system was really founded by Napoleon, who adopted very largely the innovations instituted by Tresaguet and perfected a splendid administrative system. P. M. Tresaguet, 1716-1796, was a great engineer and made many improvements for river navigation, but we know him only as a great road builder, and practically the father of modern road work. He recognized the need of constant maintenance and devised means for securing this. He improved the construction, reduced the cost, crowned the foundation so as to secure drainage, reduced the depth of broken stone used and, particularly, organized the caretakers who are the very backbone of the present French road system.

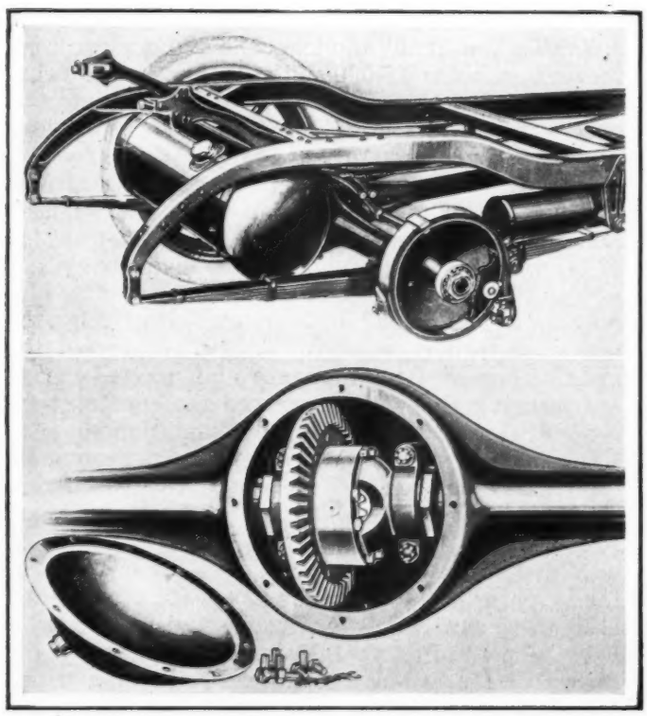
John L. MacAdam, England, 1756-1836, was not the inventor of the macadam road, for it was then used in several parts of Europe, but he seems to have been the first to fully grasp and explain the theory of the broken stone road without a paved foundation. As a youth he resided in this country, but returned to Scotland in 1783 and was soon appointed magistrate and trustee of roads. In 1816 as inspector for the Bristol turnpike trust, he supervised the reconstruction and repair of 178 miles of roads. In 1817 he built the first macadam roads in London, and the system which he advocated slowly spread throughout the Empire.



Left—Right side of Allen 1916 power plant, showing mounting of Westinghouse motor generator and also of control levers. Note oil level gage at bottom of crankcase. Right—Left side of Allen block motor, showing ignition unit and water pump

Allen Line Two Models on One Chassis

Bore ⅛ in. Larger—Wheelbase 2 in. Longer—Floating Rear Axle—Rounded Radiator, Built-in Windshield and Molded Line Bodies Improve Appearance—Other Refinements.



Upper—Rear construction of the Allen chassis for 1916, showing how the frame sweeps up and over the axle and joins to the underslung springs with a shackle at the end. Note also brake construction and fuel tank mounting. The floating rear axle is carried on Gurney bearings, the weight of the car resting on the pressed steel housing. Note cross rod equalizers for the brakes directly in front of the axle shaft

Lower—Allen floating rear axle with cover plate removed, showing mounting of bevel gear. This illustration gives an excellent idea of the accessibility of the assembly

TWO models on a single chassis will make up the line of the Allen Motor Co., Fostoria, Ohio, for the 1916 season. These are known as models 32 and 37 and are a roadster and a touring car, both selling for $795. Before this season the Allen company has been manufacturing five models and the decision to change to two models on one chassis is in line with the policy of concentration which is the tendency during the past few seasons.

Motor and Car Larger

This season the car is larger in practically every respect than it was a year ago. The motor has ⅛ in. more bore, the dimensions now being 3¾ by 5 and the wheelbase is longer by 2 in. than in last year's model, the length now being 112 in. This season the rear axle is a floating design and in exterior appearance there has been considerable alteration, due to the addition of a rounded radiator, a built-in windshield and a molded line body.

Doors 2 In. Wider

The doors are 2 in. wider with concealed hinges and the tonneau is roomier due to the increased wheelbase which has been entirely utilized in giving room to the passengers. The upholstery is easier sprung than last year, having better padding and higher grade material. A one-man top is now used, and on the instrument board has been added an electric light. Another improvement is the placing of the electric signal button at the top of the steering column. The front compartment is also roomier, providing leg room for the driver.

Block L-Head Motor

The motor is made in the plant of the Allen company and has its four cylinders cast in a single block. It is of conventional L-head design with the valves inclosed. It is cooled by the thermo-syphon system which operates in conjunction with a tubular radiator having a rounded shell. Lubrication is by a combination pressure and splash system and starting, light-

ing and ignition is supplied by a Westinghouse two-unit outfit. One of the innovations for this season is the introduction of Stewart vacuum feed.

Floating Rear Axle

A cone clutch faced with leather having a diameter of 13¾ in. and a face width of 2⅜ in. takes the drive from the motor and delivers through a three-speed selective gear to a floating rear axle of bevel type having a 4 to 1 ratio. The drive is through a single universal joint and the rear axle is carried on Gurney bearings, the weight of the car being taken on the pressed steel rear axle housing. The brakes are 12¼ by 1¾ in. service and 12 by 1¾ for the emergency, the service brake being contracting and the emergency expanding. The brake connections are fitted with equalizers.

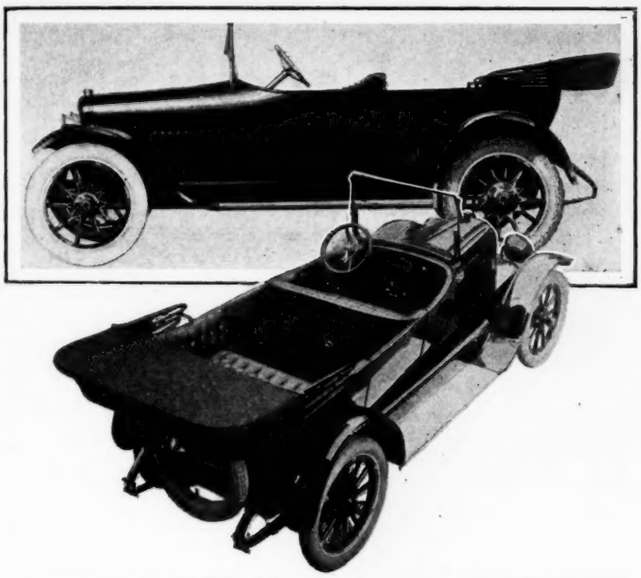
The front axle is a one-piece drop forging of carbon steel. It has an I-section. The frame is of channel section pressed steel and is braced by four cross members. High carbon steel springs are used, both front and rear being semi-elliptic, the length of the rear being 55 in. long and 2 in. wide. The wheels are 3 in. artillery type and carry Firestone demountable rims with 32 by 3½ straight side tires. The tread is standard 56 in., the road clearance 10½.

Body Features

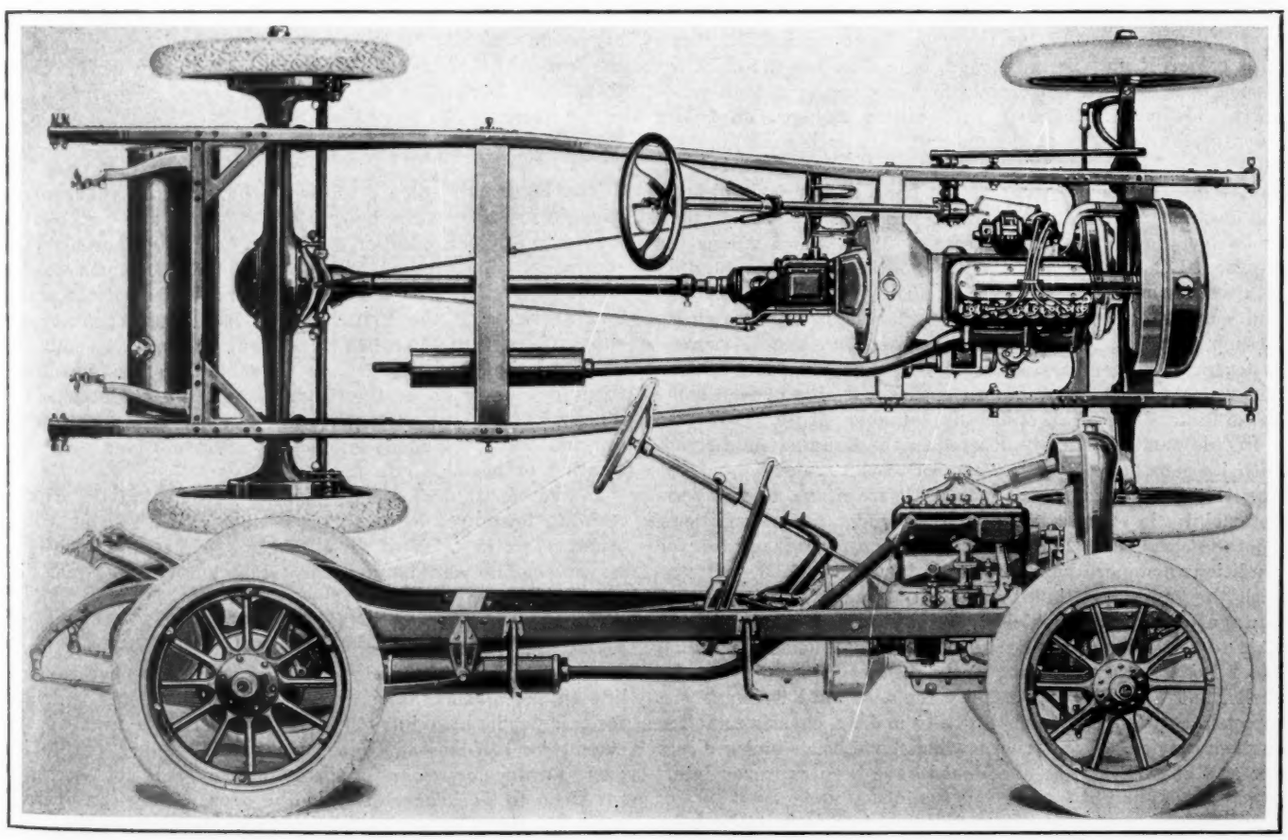
Features of the body, which is of five-passenger capacity, are the boat-like exterior and the wide doors with concealed hinges. Flush type upholstery is used and the floorboards are covered with linoleum with aluminum bindings. The instrument board contains a speedometer, lighting, starting and ignition switches, air control lever and an instrument board light. These are all flush mounted except the instrument light.

Equipment Is Complete

Black japanning is used on the fenders and radiators with the body, hood and wheels olive green. The trimmings are nickel and aluminum, and the equipment includes starting, lighting, combination tail light and license bracket, horns, speedometer, rear tire irons, extra demountable rims, rain vision windshield, one-man top with side curtains and slip cover, compound pump, tire repair kit and a complete tool kit and jack. The specifications of the roadster are the same as for the touring car except for the body, which is provided with a rear compartment accessible from either side and from the rear.



Two views of the 1916 Allen five-passenger touring car for 1916, the lower giving a good idea of the new body lines and the high narrow radiator



Plan and elevation of the four-cylinder chassis which constitutes the Allen line for 1916, showing mounting of power plant and fuel tank. Note strong cross members and also brake equalizer connections and rear tire carrier

Mobile Repair Shops Give War Service

With Tools and Equipment Mounted on Trailers These Shops Can Keep in Touch with Army Cars and Trucks for First Aid Work—Generally 25 Miles From the Front

By W. F. Bradley
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, Oct. 23—The popular impression that automobiles are short-lived in war service is not borne out by facts. One of the French armies, located at a very active point of the battle front, has roughly 2000 trucks, touring cars and special automobiles in service. The three repair shops attached to this army, and established a short distance to the rear of the lines, handle on an average 300 cars per month. Obviously the number of cars going through the repair shops is a very variable quantity, running high when there are attacks and falling very low when the opposing armies are inactive. The average of 300 repair jobs per month for a fleet of 2000 cars is based on one year's operations and includes stationary trench warfare and a period of very fierce attacks. The automobiles comprise all French makes and five makes of American trucks, as follows: Packard, Pierce, Kelly, White and Jeffery.

Engineers Broaden Their Experience

According to one of the officers in charge of one of the three repair shops, the American trucks give just as good service, on an average, as those produced by French firms. This officer, it may be mentioned, is in civil life the chief engineer of a French automobile firm producing a high-grade car. This officer, together with others engaged on repair work at the front, is of the opinion that he is attending the finest school of experience in the world. He states that in twelve months' repair work at the front a practical engineer can acquire more data and more practical experience than in twelve years of peace conditions. It is thus a mistake to suppose that the engineers of warring nations are standing still while the war is in progress. They are able to examine and compare the working of all classes of automobiles—French, English, American, Belgian, Italian and German—under arduous conditions and in the hands of poor drivers. The reports which an observant engineer is able to send home to his factory are of an unusually valuable nature.

In this particular army, located in the Champagne district, with its repair shops only 25 miles to the rear of the front line trenches, it is found that the percentage of scrapped automobiles is very little higher than under peace conditions. There is more repair work to handle than in civil service, for conditions are more hazardous and drivers cannot be selected with the same care, but this does not imply a greater percentage of scrapped vehicles. It is surprising how difficult it is to put an automobile entirely out of business by shell fire. Bodies are very frequently destroyed by fire or by shells, but they are very readily replaced, and it requires a direct hit or very heavy shell fire to make a chassis unfit for further service. Even trucks which have come under direct fire and have had to be abandoned have been captured later, towed home and put into service again.

The diversity of the work undertaken by automobile trucks is not realized by the manufacturer abroad. In addition to carrying ammunition and food to the troops in the trenches, every truck is equipped for carrying men and also for hauling guns. An immense amount of trench-making material has to be hauled by automobiles, as well as men and material for making special roads. Under present conditions the big guns rarely remain in one position more than 24 hr., and when it is required to remove them the automobile trucks are called upon in preference to horses. This of course applies to the big guns, and not to the 75 mm. field pieces, which are light and quickly removable by means of horse teams.

Moving the Big Guns

The necessity for frequent and rapid removals of big guns had been foreseen prior to the war, with the result that four-wheel drive tractors had been put into service in fairly large numbers. These, however, are not sufficient for all needs and ordinary 3-ton trucks are called upon to tow heavy guns. After being in operation for a day the guns change position at night, with the object of keeping the enemy constantly guessing as to their exact position. As far as possible, gun positions are selected near roads. Where roads do not exist, they are made specially by the use of logs placed transversely on the track. Automobiles are invaluable for such work, for by their aid it is possible to build special tracks to gun positions in a night.

Mobile Repair Shops

The automobile repair shops at the rear of the lines are capable of undertaking any kind of work, and yet can be moved to any new position within an hour of the order being received. This method of working is not common to the whole of the forces in the field. Some branches of the army, and particularly the British army, have permanent repair shops from 50 to 150 miles to the rear of the battle line, the damaged vehicles being sent to these shops by train, and returning usually under their own power. In these cases ordinary factory conditions pertain, and most of the men working in these permanent repair shops have never seen any fighting or heard a gun fired.

In the repair departments immediately behind the armies mobility is secured by mounting each tool on a special trailer truck. Two or three of these trucks are fastened up behind an automobile and hauled away to whatever new position may have been selected. The equipment comprises lathes, drilling machines, grinding machines, a case-hardening plant, and all the smaller tools required for general repair work. Electricity is used for driving the machinery, a gasoline engine and dynamo carried on a trailer being provided for this purpose. While it is essential that these repair shops should be self-moving, and capable of keeping pace with every advance or retreat of the main army, it is not necessary for them to work absolutely in the open. They can operate most effectively at an average distance of 25 miles from the front, and at this range it is generally possible to find buildings which can be readily converted to repair shop work. An

abandoned factory, a street car depot, stables or a farm with a big courtyard all form convenient centers in which to establish the repair depots. Such widely different localities as a village school and an abattoir are selected as places suitable for working in, while a factory with electric power is looked upon as ideal.

Shackle Bolts Inadequate

The units which are picked out as giving most work to the repairman are shackles and shackle bolts and springs. According to one engineer-officer, there is not an automobile truck of any make or any nationality with really adequate shackle bolts. On war service these bolts are never lubricated by the driver; indeed they are generally in such a condition that it is impossible to lubricate them, and no provision is made for an automatic supply of oil or grease. The shackle bolts of a truck working over rough roads are subject to as much stress as the wristpins within the motor; yet these latter are absolutely protected from dirt and are perfectly lubricated, while the former have no protection and no lubrication. In a rather less degree than the bolts, springs also suffer from the lack of lubrication and attention, although the breakage of springs is not as frequent as the breakage of bolts.

War Conditions Affect Lubrication

War service has shown that mechanically operated forced feed lubrication to all motor parts is not as perfect as was generally supposed. One engineer-officer, who makes use of forced feed lubrication in his own motors, has taken careful records of all lubrication troubles on trucks and touring cars with the conclusion that circulating splash gives the least amount of trouble. It is found that on war service care is not taken to change oil at sufficiently frequent intervals, poor oil is sometimes used, dirt is often poured into the motor with the oil, and by reason of the high pressure maintained these impurities are forced into the bearings.

This objection cannot be brought against forced feed lubrication in civil life, for the driver or owner can be relied upon to exercise sufficient care to keep dirt out and change impure oil at sufficient intervals.

With the ordinary circulating system to the important bearings and constant level troughs for the connecting-rod ends, there is not sufficient pressure for dirt and particles of metal to be carried along and forced into the bearings. Under the rough conditions at the war the methods of oil filtering with forced feed lubrication systems are altogether inadequate. It would appear advisable to have an oil reservoir entirely independent of the base chamber with some method of filtering equivalent to the oil filters and economizers used in factories. The oil tank independent of the motor has already been adopted on some European racing cars, and also on the latest French aviation motors, but this has been done more with a view to keeping the temperature low than to freeing the oil of impurities. The war figures show that there are 20 per cent more bearing troubles where the forced feed system is employed than with the circulating systems. This conclusion is significant in view of the fact that it has been arrived at by an engineer who was the first in France to develop the long-stroke, high-speed motor and the first to lubricate with pure castor oil delivered to the bearings at high pressure.

Clutches and Poor Drivers

Although clutches do not come into the repair shops for a great amount of direct treatment, yet war has shown them up as somewhat unsatisfactory and responsible for a good deal of damage to various parts of the transmission. In the hands of a skilled driver, or even with a man who takes an interest in his car, almost any kind of clutch will appear satisfactory. But unskilled army drivers, operating pedals through thick soled boots or wood clogs stuffed with hay, very quickly find out the weak points of a clutch. Even the best leather faced cone clutches can only be described as moderately good under war conditions. Multiple-disk clutches running in oil are rather better, but require attention to keep them in first-class condition. The only type of clutch which is absolutely foolproof and with which an unskilled driver can be relied on to change gears in a satisfactory manner is the single plate dry clutch. The war has shown the necessity for making clutches absolutely foolproof.

Simplification to Result from War

There is nothing to indicate that the war will bring about radical changes in truck design, but it certainly will be responsible for numerous detail improvements and a large amount of simplification which will tend to the general betterment of commercial vehicles. There is not a single make but is open to improvement in some respect, and the war offers an excellent opportunity to wide-awake manufacturers to improve their product. French firms have better opportunities of profiting by the war than any others, for they all have some members of their engineering staffs with the convoys or in the repair shops at the front, and these men are sending back detailed technical reports on their own and every other make of automobile. It is obvious that these reports must be more valuable than those obtained by foreign firms which only send an occasional representative or inspector to the scene of operations.

Three-Tonner the Favorite

The type of truck which the war has shown to be most suitable is the 3-tonner. Above this weight trucks are too heavy and too big for general conditions; below that weight they are too small and are liable to be overloaded. The war has shown the necessity for uniform platform heights, so as to facilitate loading and unloading. It is quite likely that a standard height will be agreed upon in each country, so as to accord with the height of railroad trucks and loading platforms. Even now radiators are not given sufficient protection for war service. The substantial buffer uniting the ends of the frame members, as on the Packard truck, is considered insufficient by the French, and is supplemented by bars to the full height of the radiator. Bars attached to the radiator, as on some of the London buses, are also inadequate. It should be remembered that trucks are liable to collide with overhanging bodies, and that in such cases a protecting bar on the level of the frame members is of no use whatever.

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Amalgamite Self-Lubricating Bearing

CHICAGO, ILL., Nov. 6—A new self-lubricating bearing, in which graphite is intimately mixed with the metal forming the bearing and in which bearing no other lubrication other than that afforded by the graphite is needed, has been brought out by the Dann Spring Insert Co., this city, which is furnishing the bearing for small bushing work such as spring eyes, universal joints, steering gear, and similar parts. This new self-lubricating metal, known as Amalgamite, is a compound in which the bearing metals are pulverized physically rather than melted by heat. In this pulverized condition the metal is mixed with air-floated flake graphite, the metal and the graphite being pressed into a steel shell which serves as a container for the bearing compound, many tons pressure being used in the work. Thus, instead of pouring the bushing it is pressed into formation. The graphite is not in layers, spotted, put in depressions in the metal or held in the metal by any adhesive but is mixed physically so that the cellular structure of the metals is intimately combined with the graphite, the theory being that it is a molecular mixture of the metal and graphite, so that graphite is a part of the warp and woof of the bearing.

The Rostrum

Water May Help Carbon Troubles

EDITOR THE AUTOMOBILE:—A copper tank, adjusted to the exhaust pipe, containing 2 qt. of water is connected by copper tube to intake manifold. The suction of the intake stroke takes the vapor with mixture to explosion chamber. Provided the small amount of water in the vapor gets to the chamber, will it cause more power, less carbon and tend toward economy?

Needham, Mass. F. T. R.

—There are many theories advanced for the action of water in the intake manifold and all of them are combated just as strongly as they are advanced. One of the theories held quite widely is that the water if entering in very minute quantities will be transformed into steam which on coming in contact with the blowing carbon will form carbon dioxide, thus cleaning the cylinders of carbon. It is generally accepted that no increase in power is given by the admission of water. There does not seem to be any reason why the economy should be better.

Hupmobile Oiling System Satisfactory

Editor THE AUTOMOBILE:—Can you tell me what lubricating system I could put on a Hupmobile model 20 other than the one which is now used by the Hupmobile company on this particular model?

Evansville, Ind. P. C. F.

—If desired a pressure feed could be put on the Hupmobile 20 but this would be altogether unnecessary as the gravity system now in place is an excellent one and works out well for any speeds of the car. The cam adjustment on the top of the oil box on the side of the motor provides a faster or slower proportional flow in coincidence with the throttle opening and gives all the oil necessary. To install the pressure feed it would mean an externally driven pump that could be taken by friction from the flywheel, which is at the front end of this motor. The oil leads will then have to be run into position and altogether it would make a job which would be more complicated than necessary.

Ammeter for Delco on 1914 Cole

Editor THE AUTOMOBILE:—Please advise how to connect up an ammeter to the electrical system, Delco, of a 1914 Cole 4-40.

Newark, N. J. E. C. McC.

—In installing the ammeter in the generator circuit of the 1914 Cole-Delco system, follow these directions:

On the top cover of the Delco motor-generator, rear end, are two terminal posts. The smallest one is the generator shunt field post and is connected to the bottom terminal of the voltage regulator tube. This generator post is not to be disturbed.

Remove the cable from the largest generator terminal post (which is the main generator positive post), cut off the brass terminal clip and pull this wire out of the metal conduit. Mount the meter at the desired location, and this loose, free wire, that has been removed from the metal conduit, connect to the negative post of the ammeter. Pull a new cable into the metal conduit, and connect one end to the positive post of the ammeter, the other end being connected to the main generator positive post, replacing the cable that is connected to the negative post of the ammeter. The brass terminal clip should be resoldered on the generator end of the cable that is newly installed. This arrangement places the ammeter in series in the main generating circuit.

An ammeter should be used that has its zero near the center of the scale, an 10-0-30 instrument being the type most commonly used for this work. When thus connected, the ammeter will indicate a discharge when operating as a shunt motor, as in starting, just prior to cranking the engine; indicating the charge rate, when the engine is running, and no ammeter reading will indicate trouble in the generating apparatus.

Possibly Oil in Commutator

Editor THE AUTOMOBILE:—I have a 1916 Maxwell car, and would kindly ask you to inform me just what may be wrong with the electric lighting and starting system on this car. The ammeter charges as long as I keep the car running above 10 or 12 m.p.h., but when I slow down to less than this number of miles for a little while and then speed up to even 25 m.p.h., the ammeter does not indicate charging, but remains at 0. Then, if I stop the engine, and start again, the ammeter continues to charge as before. I have used the car about six weeks, have run it 650 miles and the test of the specific gravity of the storage battery is 1250 or a little more. The mechanic at the service station in our city has not been able to locate the trouble, and does not think there is anything wrong. What do you say?

Hagerstown, Md. E. C. B.

—It is possible that all the connections are not tight and that they occasionally make poor contacts, decreasing the output due to the additional resistance. It is also found that oil in the commutator or brushes will cause trouble similar to that you describe. This is due to the fact that at low speeds the oil will sufficiently insulate the brushes from the commutator so that when the generator just commences to turn over and is producing only about 1 volt, the oil will prevent a circuit so that the output is zero. Of course, at times when running at high speed, the brushes may be able to touch the commutator, allowing the fields to become saturated and the output normal. It is also possible that the ammeter needle may be sticking and the vibration of the car at high speeds is sufficient to loosen it.

Compression Space for 85 Lb. Per Sq. In.

Editor THE AUTOMOBILE:—What are the cubical contents of the compression chamber for a 5-in. bore by 7-in. stroke motor above the piston when it is on top dead center, to get 85 lb. compression cold, assuming that the inlet closes 30 deg. past bottom dead center?

New York City. J. H.

—The displacement of one cylinder of a 5 by 7 motor is 137.5 cu. in. According to accepted tabulations in order to obtain 85 lb. compression the cylinder clearance should be about 23 per cent of the piston displacement figuring low.

With this percentage the volume of the compression space would be 31.625 cu. in.

The above clearance is taken as the minimum. Under maximum conditions of tightness, etc., to obtain 85 lb. per square inch compression the cylinder clearance can be 35 per cent of the piston displacement. All the pressures given above are in pounds per square inch absolute.

Shipping Weight of Packard Twin-Six

Editor THE AUTOMOBILE:—What is the shipping weight of the Packard twin six?

2—What is the fuel consumption of these cars at 20 m.p.h.? What compression do they use? What is the tire and fuel cost per mile?

3—How does the progressive gearshift lever engage its gears? How does the H quadrant lever select its gears?

4—Please show the mechanism which make its impossible to shift gears while the clutch is engaged?

5—What is the correct pronunciation of Renault, Goux, Boillot, Bleriot?

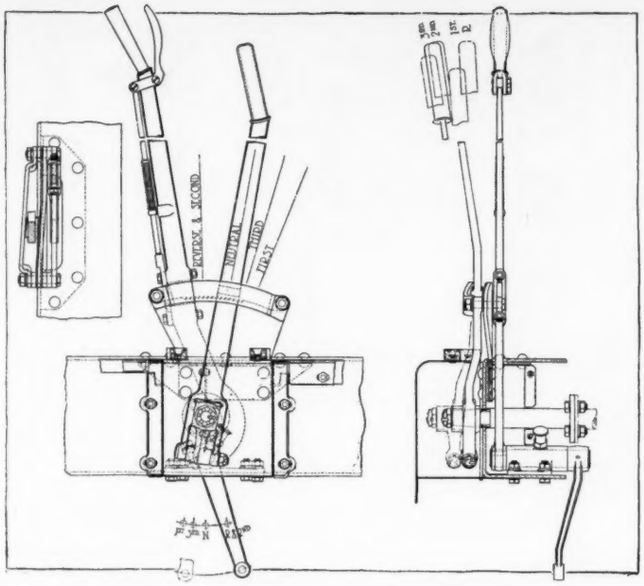
Mount Sterling, Ohio. C. W. S.

—The model 1-25 seven-passenger car complete with full liquid supplies and two spare tire rims weighs 4500 lb. The model 1-35 seven-passenger car with full liquid supplies and two extra tire rims weighs 4590 lb.

2—The fuel consumption at 20 m.p.h. is approximately 12 miles to 1 gal. The compression used is from 75 to 78 lb. The tire and fuel cost per mile will depend on the individual driver and the country.

3—Progressive gearshift levers engage their gears in the order 1, 2, 3, 4 or 4, 3, 2, 1 while with the H quadrant or selective gearsets the gear desired can be selected at will.

4—There is no such mechanism as this on the Packard twin six. The gearshifting arrangement employed in this car is shown in the accompanying illustration Fig. 3. In case you would be interested in the gearshifting lever system employed in the Packard twin six, THE AUTOMOBILE is showing Figs. 1 and 2, two assembly drawings of the mechanism. You will note that the gearshift lever is of the selective side rocking type. The shifter finger which engages the gearshift rods in the transmission case, is made with an auxiliary portion carrying a face cam which runs between two rollers mounted in a lateral sliding plunger in the transmission case beneath the gear shifter rods. This plunger has a slot in its upper side adapted to register with whichever of the gear shifter rods is engaged by the gearshifter lever. The other gearshifter rod is consequently positively locked against any movement, and it is also impossible to move both gearshifter rods at the same time.



Figs. 1 and 2—Two assembly views of gearshifting lever arrangement used in the Packard twin six

One of the rollers pressing on the face cam on the gearshifter lever is carried in a plunger backed up by a heavy, coiled spring. The face cam has a notch for neutral position and has a fairly steep cam action down each side which assists in shifting into any gear once the change speed lever is moved forward or back out of the neutral notch. In addition to this assistance to gearshifting given by the cam and spring controlled roller, the cam is also formed to produce a lock to hold any one of the gears when engaged in its normal running position.

The travel of the gearshifting rods fore and aft, is regulated by adjustable stops at the ends, and when any gear is engaged it is retained in position by the shifter rod being held against its stop through the shifter lever face cam and the spring-controlled roller.

5—The correct pronunciation of Renault is Ren'-olt; Goux, Goo'; Boillot, Bwah'-lo; Bleriot, Bler'-ee-oh.

Blown Fuse Due to Shorting

Editor THE AUTOMOBILE:—I have a Saxon six touring car equipped with a Gray & Davis starting motor. When running at a speed of 15 m.p.h., or over, the generator generates too much current. The automatic cutout does not work, and the 20-amp. fuse is burned out. Please advise why the

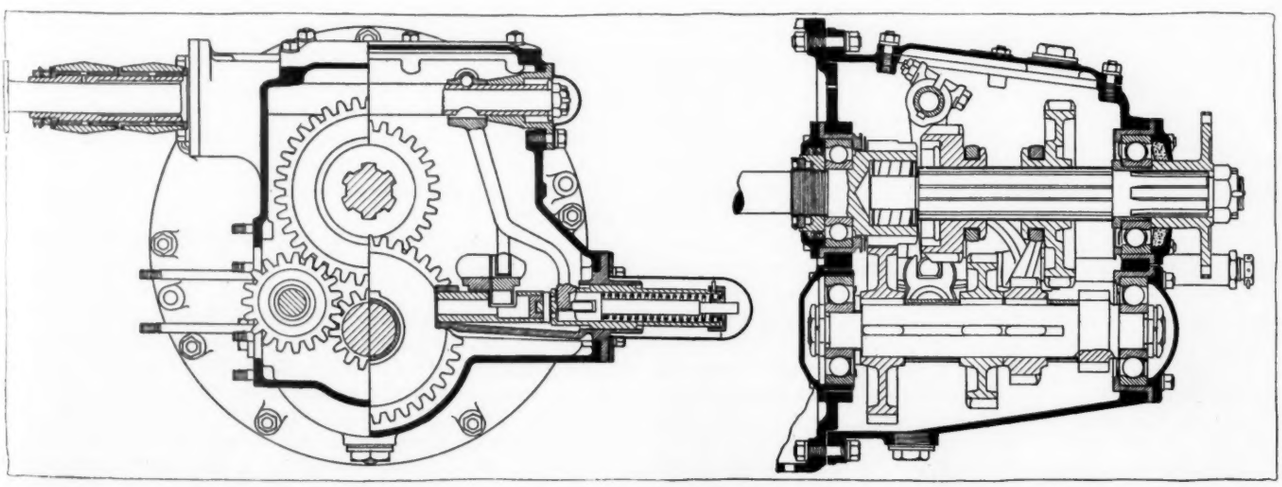


Fig. 3—Sections through the gearbox and gearshifting mechanism employed in the Packard twin six

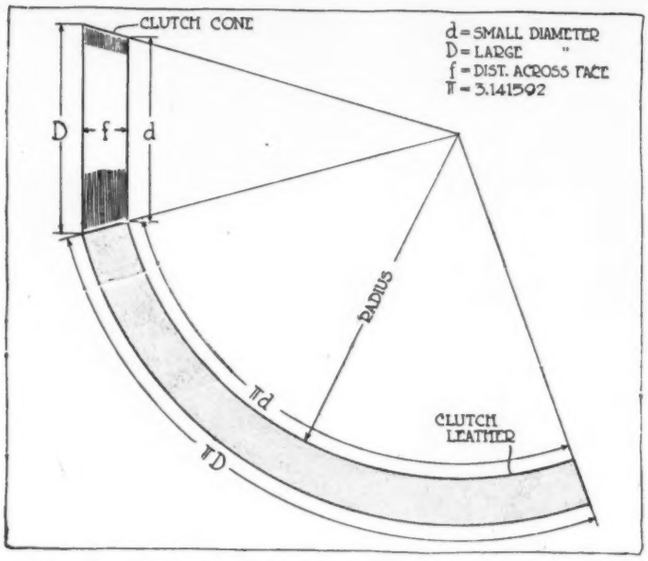


Fig. 2—Method for laying out leather for a clutch cone

generator generates too strongly and if the trouble in the cutout is in the adjustment.

2—Who manufactures the rear axle for this car?

3—What is the make of engine?

4—What makes a grinding sound when the engine is pulling hard? Is it the clutch slipping?

Weston, W. Va. C. J. L.

—The fuse on this car is rated at 30 amp. instead of 20 and is designed to carry 30 amp. and blow at about 50 amp. For this reason it is quite impossible that the generator could burn this fuse when running. The cause of this fuse blowing is either a short-circuit in the wiring or possibly the horn circuit or because the cutout has failed to open when the engine stopped. The cutouts are set properly and sealed before they leave the Gray & Davis factory and the guarantee in the instrument is revoked on the breaking of the seal by the customer. It is therefore recommended that this apparatus be taken to the nearest Gray & Davis service station or return it to the Gray & Davis factory in Boston, Mass.

2—The rear axle is manufactured by the Timken Detroit Axle Co., Detroit, Mich.

3—The motor is made by the Continental Motor Mfg. Co., Detroit, Mich.

4—The grinding noise you mention can probably be traced to the starter chain.

Laying Out Cone Clutch Leather

Editor THE AUTOMOBILE:—Please give me a diagram illustrating the most practical way to lay off a piece of leather for a cone clutch, knowing the largest diameter, the smallest diameter and the distance across the face of the cone.

2—In applying a new leather to the clutch, is it correct to soak the leather in oil and if so, before or after applying same to the cone?

3—What limits the distance apart the points of a spark plug may be set and the electrical reason for same?

4—What is the distance from edge of the float chamber to the surface of gasoline when same is at the correct level in a 1¼-in. carbureter.

5—The model 10, 1910 Buick comes regularly equipped with a 1½-in. carbureter, and in the event that a Holley carbureter was to be substituted, what would be the proper size to use?

6—Would increasing or decreasing the taper of the needle point in the jet of a carbureter, affect the mixture allowing that the same amount of gasoline passes in each case?

7—What means are used to take the back lash out of bevel gear in back axle of 1910 model 10 Buick?

Cheriton, Va. H. S. A.

—The diagram showing the method for laying out a piece of leather for a clutch cone is shown in Fig. 2. The largest diameter is signified by *D*, the smallest diameter by *d* and the distance across the space by *f*. The character π is equal to 22/7 or 3.14.

2—Before working the leather soak it in neat's-foot oil.

3—The distance between the points of the spark plug is set to secure the maximum efficiency. The current is capable of jumping a certain gap. At the extreme dimensions of this gap, the spark will be thin and weak, at the minimum dimensions the spark will be intense but short. A mean is adopted to provide a thick spark of reasonable length.

4—The level is such that the gasoline is 1/16 in. below the fuel nozzle.

5—A carbureter of the same size should be used.

6—The taper on the metering pin will affect the mixture as it governs the distribution of the section, a certain proportion of which falls on the gasoline jet and the remainder on the air intake.

7—No adjustment was provided on the rear axle in the model 10 Buick. The only method by which you can correct the mesh of the ring gear and pinion is to insert washers or shims behind the thrust bearings. This must be done while the axle is disassembled, and proper mesh is very largely a matter of trial and error.

Oxygen Flame Not Harmful

Editor THE AUTOMOBILE:—I shall be greatly obliged if you will advise me of your opinion as to the desirability of removing carbon by the oxygen flame method. It will be of interest to know whether, aside from the convenience of the method, it is even remotely harmful to the motor or likely to cause warping in the valves. I have followed your inquiry department, but have seen nothing bearing directly on this question in which I have no doubt, many motorists are interested.

Brooklyn, N. Y. P. S. CLARKE.

—No harm will result from removing the carbon by the oxygen flame method. When this is done the piston of the cylinder which is being operated upon should be at top dead center to be sure that the carbon is removed from the piston head. The temperatures within the cylinder are not near what they are in actual operation of the motor and although it is true that the water in the circulating system is not in motion, the temperature reached in burning out the carbon is not sufficient to do any harm.

Piston Displacement of 4 by 6 Four

Editor THE AUTOMOBILE:—Will you kindly explain through THE AUTOMOBILE what, and how obtained, the compression space will be for a 4 by 6-in. stroke four-cylinder motor with 90 lb. compression, cold. After stating the cubical contents of the compression chamber, will you also work this out so that I may study same carefully to familiarize myself with it?

2—Please explain what is meant by the mechanical compression ratio.

New York City. A. W. W.

—The piston displacement of a 4 by 6 four-cylinder motor is 301.6 cu. in. For one of the cylinders, the displacement is 75.4 cu. in. The relationship between the volume of the combustion chamber and 75.4 cu. in., therefore, must be such that when the piston is at the top stroke the pressure in the combustion chamber is 90 lb. per square inch absolute.

There are two methods by which a gas can be compressed and expanded. One is known as the adiabatic method in which no heat is either abstracted from or given the gas.

The other is the isothermal method in which the gas is kept at a constant temperature due to the use of water jacketing. The conditions in a gasoline engine cylinder are somewhat between adiabatic and isothermal. Therefore, these two conditions may be taken as extremes and the proper volume for the desired displacement will be somewhere between the two limits secured by calculation on adiabatic and isothermal bases.

Taking adiabatic first, the formula which air follows when compressed is

$$PV^{1.4} = P_1V_1^{1.4}$$

Let $P = 14.7$ lb. per square inch or atmospheric pressure.

$V = (75.4 + V_1)$ = Displacement plus compression volume.

V_1 = Combustion chamber volume, the unknown quantity.

P_1 = The compression pressure or 90 lb. per square inch absolute.

Then the equation becomes:

$$14.7\ (75.4 + V_1)^{1.4} = 90\ (V_1)^{1.4}$$

$$\frac{90}{14.7} = \left\{\frac{75.4 + V_1}{V_1}\right\}^{1.4}$$

Taking the 1.4 root of each side of the equation we have

$$\frac{75.4 + V_1}{V_1} = \sqrt[1.4]{\frac{90}{14.7}}$$

Solving, $V_1 = 29$ cu. in.

Taking the isothermal equation,

$P\,V = P_1\,V_1$ and substituting the equation becomes

$14.7\ (75.4 + V_1) = 90\ V_1$

solving $V_1 = 14.7$ cu. in.

The required combustion volume will therefore be somewhere between 15 and 29 cu. in., or perhaps 22 cu. in.

2—By mechanical compression ratio is meant the ratio of the cylinder volume to the combustion chamber volume.

Motor Made by Garford Co.

Editor THE AUTOMOBILE:—Some time ago I purchased a motor for installation in a boat and since I now desire to add an electric starting and lighting system, I find it necessary to have some data concerning the speed, gear ratios, etc.

The motor was taken from an old Studebaker roadster, and I understand it was made by the Garford Co. The cylinders are four in number, supposed to be 4¾ by 5, cast in pairs. Crankcase is of aluminum, with four supporting lugs, flywheel at after end, bored for cone clutch; fitted with Remy high-tension magneto and centrifugal water-circulating pump.

1—Can you tell me whether such a motor was made by the Garford company?

2—Has THE AUTOMOBILE published at any time the horsepower and torque curves of this type of motor?

3—Can you give the formula by which the horsepower of electric motors, necessary for cranking this motor, can be calculated?

4—Please show the wiring diagram for the Remy high tension magneto; the proper disposition of the cable containing three conductors, red, black and yellow. This is not understood.

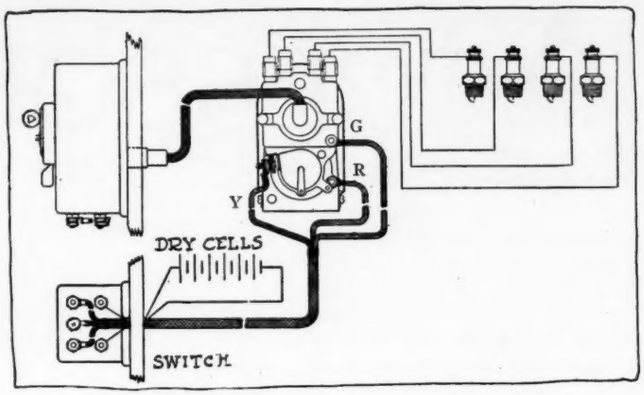
Brooklyn, N. Y. J. F. K.

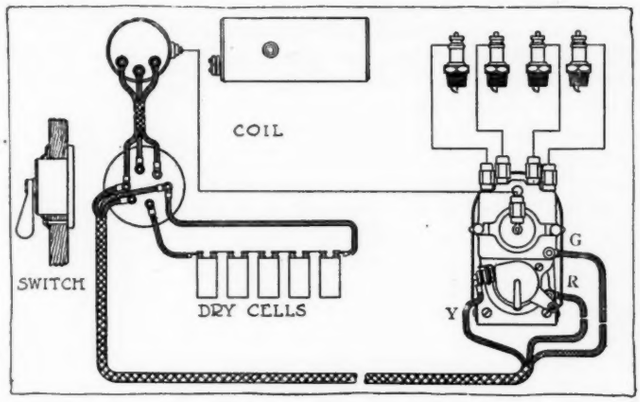
—The motor you describe was doubtless made by the Garford Co. as the bore corresponds to their motor, but the stroke is 5¼ and not 5 in. The Garford company fitted this with a Bosch low-tension magneto.

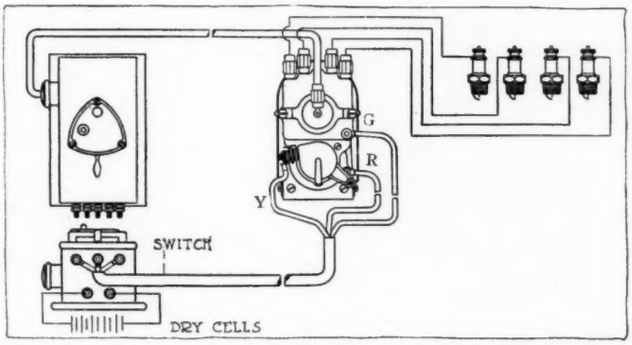
2—No.

3—This will depend on the speed at which you wish to crank it. If the pull, for instance, is 50 lb. to crank it at an arm length of 10 in. the energy necessary is 500 lb. in. or about 43 ft. lb. If it is necessary to exert this through a distance of any given amount it is easy to measure the power necessary in terms of foot pounds per minute. The number of foot pounds per minute divided by 33,000 will give you the horsepower of the motor required for cranking the engine.

4—The Remy Magneto Co. has been in business for about seventeen years and during that time has manufactured many different types of what are commonly known as high-tension magnetos. This concern, however, has never placed upon the market a strictly high-tension magneto, but has used the type in which the current is stepped up in a separate transformer coil. A few typical illustrations of Remy installations are given in Figs. 3 to 5 and you will note on practically all the coils the terminals are marked Y, R and G, standing for yellow, red and green, so that the person using them would know how to wire the coil. As a rule the connections on all the magnetos are the same, that is, the green wire is connected to the live terminal of the magneto, the yellow wire to the circuit breaker and the red wire to the ground terminal.







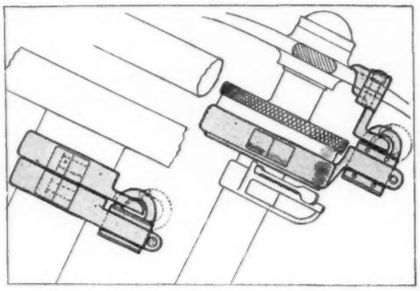
Figs. 3, 4 and 5—Typical Remy high-tension magneto wiring diagrams

ACCESSORIES

Deitz Steering Wheel Lock

THIS is a simple device for locking the steering wheel. A special design being made for Fords, and a different model for other cars. The general model consists of two metal clamps for the steering post, with a small padlock firmly bracketed in the lower clamp and three attaching rings as a part of the upper clamp. This arrangement provides for locking the steering post whether the car is standing with the wheels set straight ahead or whether it is left in such a position that the steering wheel is turned to the right or left. This makes the device easy to use if the car is driven up to the curb and left hurriedly without squaring the position of the wheels. The Ford model is similar in working principle, but here the upper clamp is fastened directly to an arm of the steering wheel. For locking in different positions, this model must depend upon three lock brackets on the lower clamp.

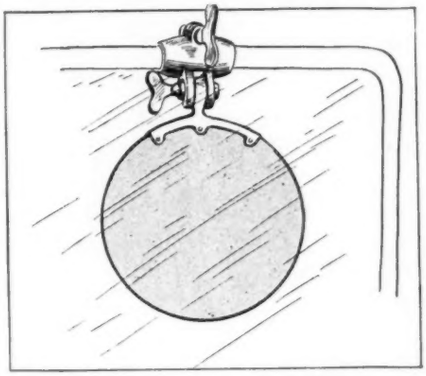
These clamps can be made of either forged steel or hard bronze, and are fastened by a patent device which will prevent removing them with a screwdriver or any ordinary tool. A small spring holds the bar of the padlock in the clear when open, thus guarding against its being jarred shut and catching the clamp which turns with the steering wheel. The device sells for $2.50.—Henry Deitz, Denver, Col.



Deitz steering wheel lock in two models

Staude Glare Stopper

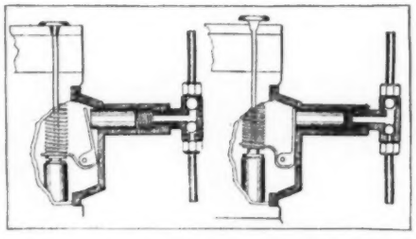
A disk of heavy glass, of an amber color, is clipped to the edge of the windshield in such a position that the driver of the car can look through it by moving his head a little to one side, when facing the headlights of an approaching car. The clip incorporates a joint which permits the glare stopper to be kept vertical even when the windshield is inclined. If the glass is broken it may be replaced for $1.25.—The glare stopper sells for $2.50. —E. G. Staude Mfg. Co., St. Paul, Minn.



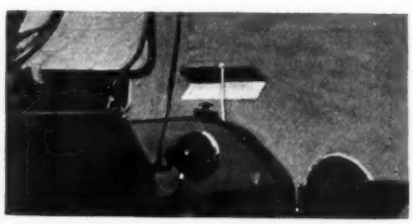
Staude glare stopper on windshield

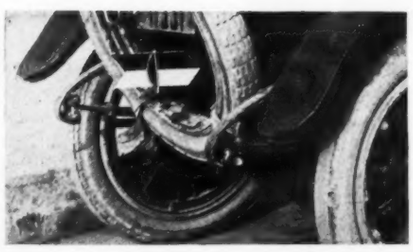
Strong Oil Pump for Fords

A plate carrying the Strong oil pump fits over the valve stem compartment of the Ford motor, in place of the regular cover plate. The pump is of the plunger type and is actuated by a rocker arm, one end of which is in contact with one of the valve lifters; the lifter raises the arm and pushes the plunger outward, discharging the oil in the barrel, and on the return stroke the plunger is brought back by a spring and sucks in a fresh charge. The oil is pumped from the bottom of the flywheel housing through a sight feed on the dash and forward to the timing gear housing from which it goes into the crankcase under the connecting-rods and is splashed. The makers state that the pump can be installed in 20 min. It sells for $5.—Perkins Mfg. Co., Des Moines, Ia.



Strong plunger oil pump for Ford cars





Kruse direction signal on car

Kruse Signal

The Kruse mechanical signal indicates both in front and behind the car which direction a motor car intends to take at a street intersection. It consists of two signal arrows, in regulation red and green, mounted upon nickeled steel rods, which are turned by a cable passing around a pulley at the base of each rod and controlled by a lever attached to the steering post. This lever runs down alongside the post to a universal joint at the floor of the car, where it connects with the cable. The front signal stands above and in front of the radiator cap, while the rear one is fitted to a bracket midway between the springs and near the tail light.

The device is simple in construction, easy to operate, made to fit any style of machine, and can be adjusted to prevent rattling or getting out of order. Being operated mechanically, there is no upkeep expense for batteries or lights.

The position of the two signal arrows is such that the front one is well lighted at night by the side lights on the car equipped with the device, while the rear arrow is made clear either by the tail light or by the headlights of any car following at all closely. The signal sells for $10.—National Auto Signal & Mfg. Co., Denver, Col.

Answer Spark Plug

A spark plug which the owners claim will not break, leak, soot or oil soak has been brought out under the name of the Answer. It is made in every size including ½-in. standard, ½-in. extension, ⅞ S. A. E., ⅞ extension, metric and Ford. There is also a metric motorcycle size. The plug is shown in section herewith and, as will be noted, there is a steel spindle which acts as the core of the plug. Surrounding this is mica insulation 3/32 in. thick. The shell is made in all sizes and the terminal is a combination design suitable for screw cap connection or snap-ons. The price of the plug is $1.—Hill Mfg. Co., New York City.

U. S. E. Shock Eliminator

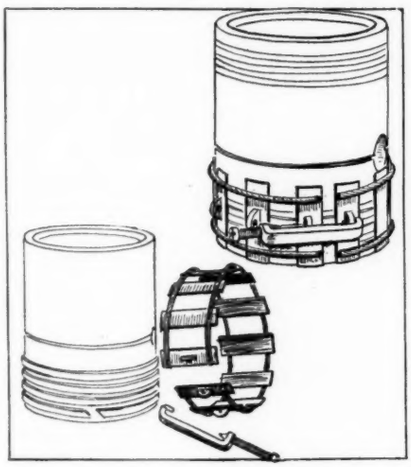
The U. S. E. shock eliminator and bumper combined is a mechanical device which is attached between the frame of the car and the springs. It consists of a metal casing in which are assembled spiral springs having between them a reciprocating trunnion ring attached to

the main connecting-rod. This connecting-rod, being joined to the lever which is pivoted at one end of the shock absorber and at the other end to the car spring, receives the force of the shock from the car spring and transmits it to the spiral springs of the shock eliminator where it is absorbed by their reciprocating action. The bumper, which is a part of the front U. S. E. shock eliminator, is connected with the internal spring so that any blow received by the bumper is absorbed by their action. The prices are: Front pair, including bumper, $60; rear pair, $50; rear pair, underslung, $40; small car equipment, $80, and for attaching complete, $10.—Universal Shock Eliminator, Inc., New York City.

U. S. E. combined shock eliminator and bumper

Morgan Piston Ring Tool

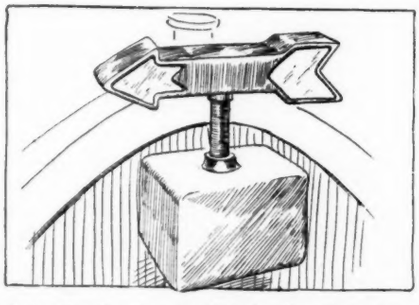
In this tool a series of flat steel bars are connected together by two flexible steel cables, the last bar on one end and several of the bars on the opposite end being fitted with lugs. The device is wrapped around the rings of a piston and a small clamp, which is furnished with the tool, is placed on the two lugs which are the right distance apart and screwed up until the rings are well down. When the piston is inserted in the cylinder the device is pushed off the rings as they enter the cylinder in succession. This tool sells for: 2 to 4-in. pistons, 50 cents; 3 to 5-in. size, 75 cents, and 4 to 6-in., $1.—Morgan Mfg. Co., Newport, R. I.



Morgan's piston ring compressing tool

Auto Traffic Arrow Signal

To indicate by day or night to other vehicles, pedestrians or traffic officers the direction to be taken or the intention of stopping, a traffic signal under the name of the Auto Traffic Arrow is marketed. The outfit consists of two metal motor boxes, one secured to the top of the radiator and the other at the rear. From the mechanism in each box an inclosed shaft extends upward and upon this is mounted an arrow finished in highly polished nickel. Within these arrows are powerful miniature electric lamps which illuminate them at night, indicating plainly by night or day the direction which is to be taken.



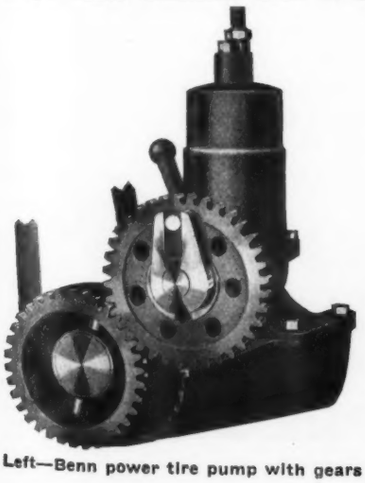
Auto Traffic Arrow electric direction signal

The action of both front and rear arrows is controlled by a set of three buttons clamped to the steering wheel or post or anywhere desired. A touch of the button is sufficient for the operation of the arrow and it is not necessary to hold the button down as the arrows remain locked in position until one of the buttons is again pressed.

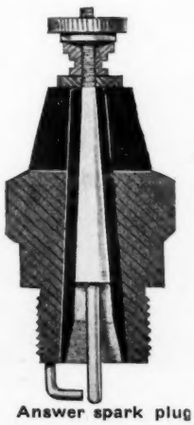
Both arrows turn simultaneously when the corresponding button is depressed for right or left. In addition to the arrow in the rear of the car there is also a disk which is illuminated at night and when the driver presses down upon his brake to bring the car to a stop the disk makes a half turn showing the word, Stop. When the brake is released the disk turns back to its original position.—The Auto Arrow Signal Co., St. Louis, Mo.

Benn Power Tire Pump

This is an all-metal pump with steel crankshaft in one long bearing. The connecting-rod is of bronze and cylinder and piston of gray iron. The pump is permanently attached, brackets and driving gears being provided to suit various motors. The makers state that the pump for Fords will put from 45 to 60 lb. pressure into a tire in 1 min. The construction is exceedingly simple and compact. There is an asbestos oil separator which will last a year or two before requiring renewal. Standard type $8, Ford type $7.—Benn Pump Works, Boston, Mass.



Left—Benn power tire pump with gears and clutch. Right—Section



Answer spark plug

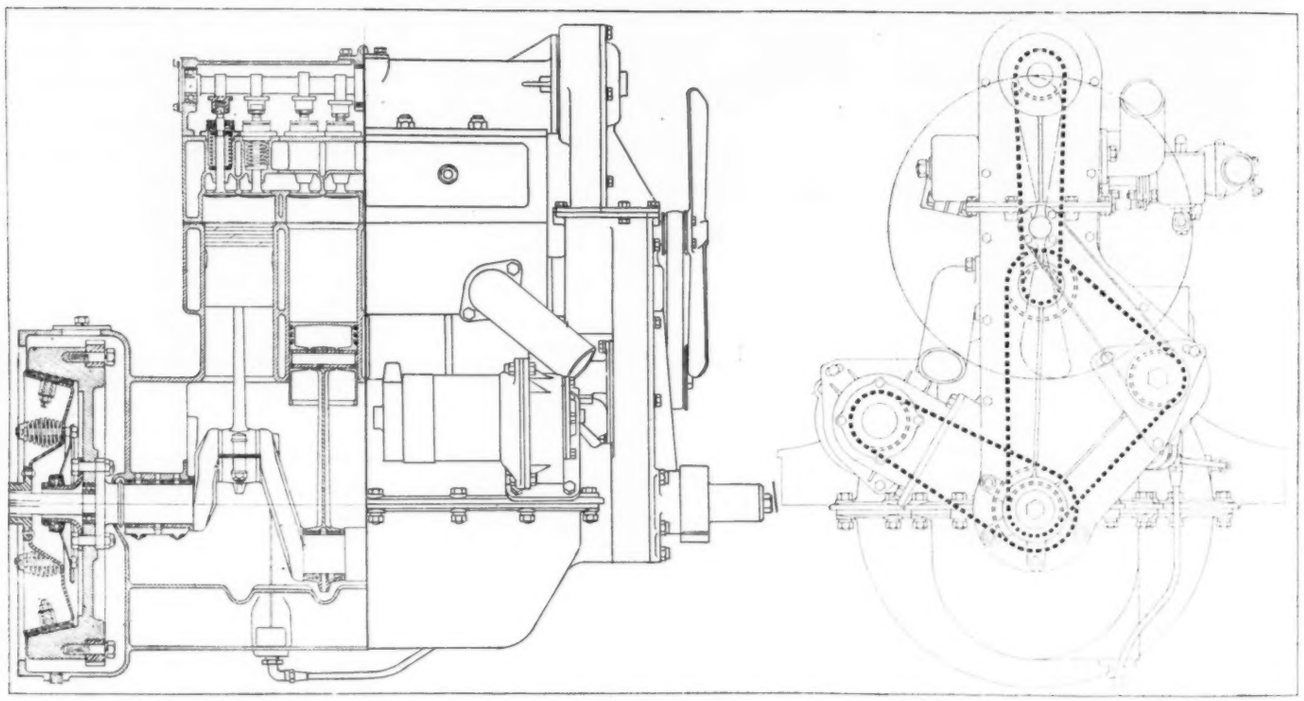
Kumpy Jitney Bus Sign

An illuminated sign giving the destination of the jitney buses is one of the early accessories to appear in connection with the movement toward the low-priced transportation medium. They are similar to the direction signs on street cars, having a roll of canvas or duck on which are painted the destinations of the jitney. The roll is inclosed in a box with a glass front, through which the destination is visible. The sign is equipped with two 12-volt lights, which are supplied with current from the battery on the car. The required destination can be placed in front of the glass by simply turning a crank, and the sign itself can be mounted on the windshield if desired. The signs sell for $5.—Walter Odell, Kansas City, Mo.

Shanhouse Motor Suit

The Shanhouse is a one-piece slip-over suit of olive khaki, designed to protect the clothing when working about the car. It can be donned quickly and easily and covers the clothing completely and has no flapping ends or corners. The suits sell for $2.50 each.—W. Shanhouse & Sons, Rockford, Ill.

Overhead Valves in Farmack Four



Left—Four-cylinder block motor used in Farmack car. Right—End view showing chain layout for overhead camshaft drive

THE Farmack car is made by the Farmack Motor Car Corp., Chicago, Ill. This is a new concern headed by A. J. Farmack, formerly of Detroit, who is president and general manager. The car appears in three body styles on a single chassis, a roadster and a five-passenger touring car at $855 and a cabriolet at $1,155.

The car has a wheelbase of 112 in., a four-cylinder block 3½ by 5 in. motor, 33 by 4 in. tires.

The feature of the Farmack car is the overhead valve, overhead camshaft motor. As will be seen from the illustration of the motor, the valves are directly in the head of the cylinder and are operated by a camshaft above them and whose cams push directly on the valve stems or extensions of the valve stems. The camshaft is operated by a chain drive which is a two-stage drive, the first stage being a triangular chain around sprockets on the crankshaft, magneto and an idler. A secondary chain from the idler to the camshaft sprocket carries the drive to the latter.

Accurate adjustment of the timing of the camshaft drive is provided by an arrangement at the sprocket end of the camshaft by which the camshaft is driven from its sprocket through a tooth clutch which permits the adjustment to be varied to as close limits as one-tenth of the width of a gear tooth instead of the smallest adjustment being the width of a gear tooth as would be the case without this subdivision. The valve stems are provided with an adjustment for wear and the contact points of the cams are of the mushroom type, both of which features are designed with the idea of eliminating noise. The tungsten steel valves are 1 3/16 in. diameter with a lift of ¼ in. The motor can be divided into four parts, first the crankcase which is split horizontally; second, the cylinder block; above this the cylinder head carrying the valves; and above this the camshaft with its cover. The crankshaft has two bearings, 2 by 2¾ in front and 2 by 3½ at the rear, bronze backed and babbitt lined.

The lubrication system combines a splash system with the level maintained by a plunger pump. This pump supplies oil directly to the camshaft chamber and to the camshaft bearings, the entire chamber being flooded with oil. An overflow from the top of the motor carries oil down to the splash troughs into which the connecting-rods dip.

Cooling is by thermo-syphon and the electric system is Bijur two-unit with Willard battery and battery ignition.

From the engine power is transmitted through a cone clutch with spring inserts and this has an arrangement for adjustment. The three-speed gearset is made by the Grant-Lees company and uses New Departure bearings throughout. From this the drive is taken through an inclosed propeller shaft with a universal joint immediately back of the gearset. This is supported on the yoke, the drive being carried through three-quarter elliptic springs. The rear axle is floating.

The braking system includes internal and external brakes on 1¾ by 12-in. brake drums, tires are 33 by 4 in. and non-skid in the rear on demountable rims.

Farmack five-passenger touring car which sells for $855

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Standardizing Pistons

THE suggestion to adopt a standard formula for piston design, or to set up a range of standard pistons covering practically all automobile requirements, needs rather more consideration than have most of the existing S. A. E. standards. A standard to be a good, useful and efficient thing must benefit everyone. The piston standard would certainly cheapen pistons, because it would convert them into a specialized product instead of being an individual one, as they now are. Standard ring sizes would help a business that is already highly specialized and, most of all perhaps, the dealer would feel the benefit because his stock of spare pistons and rings could be reduced enormously. The owner, coming last in the chain, would obtain indirect benefit.

But, and now comes the big question, is it possible to standardize pistons while they are in a state of evolution?

This year piston design has been entirely changed by the coming of aluminum alloys which will withstand the conditions, and the case is further complicated by the many patterns of special rings which are now in competitive, experimental use. Thus, it appears that any standard will have to be experimental also. To make the attempt is good, but it should be made with due caution, for the case is so different that past experience of the benefits of simple standards is not fully informative.

Gas-Electric Progress

AN event of 1915 which should not be allowed to pass without due recognition is the successful marketing of a gas-electric passenger automobile. Despite many attempts in the past, it has been left to America in the present year to manufacture in a standard form a passenger car without gear connection between the engine and the road wheels.

Of course, this particular machine is being manufactured on a small scale only, but it has sold in a quantity sufficient to prove the existence of a market, and it is more than probable that the demonstration of ability thus provided will lead to the production of gas-electric passenger cars on a far larger scale.

There are as many types of electric and semi-electric transmissions as there are kinds of gasoline motors, so the possibilities for development are vast, but just as quantity output has made the ordinary automobile what it is to-day, so will quantity have to exercise its influence before the gas-electric car settles into a standard form.

It is inconceivable that the success of the first *commercial* essay with a vehicle of this type will not be followed by larger scale manufacture, and early experiments in this connection are to be anticipated.

Electric Steel

IN spite of the contrary opinion of many it cannot be doubted that the majority of metallurgists in this country welcome the growth in the use of electric furnace steels. With the constant wish to be always seeking something better in the way of materials, it is but natural that a process which increases the good qualities of steel should be welcomed. True, in the present state of development steel made by this process costs more; but it can hardly be doubted that the general adoption of the product for parts which are subjected to puzzling stresses of a dynamic nature would greatly lower the price.

In buying any grade of material first cost alone should never be considered, and even while the price of the electric furnace steels remains above that of the open hearth products, it would be well for the manufacturer who is obliged to scrap a high percentage of parts upon which high machining costs are placed, to consider the advantages of the more expensive but more uniform and purer product.

In this great industrial country it has been estimated that we use approximately the same quantity of electric furnace steel in one year that Germany does in a month.

The war also has had its influence. While we imported thousands of tons of electric furnace steel before the conflict started, the supply has now been shut off with the result that the steel is being made here. This increased production is the very factor needed to reduce prices, and there are many who believe that increased production, combined with the lower wastage factor, will rapidly bring to the front the purer and more uniform product.

$15,000,000 Overland New Pref'd

7% Stock Convertible into Common at $300 Per Share—$50,000,000 Common

NEW YORK CITY, Nov. 10—The Willys-Overland Co. yesterday announced an issue of $15,000,000 new convertible 7 per cent preferred stock which will be offered to holders of the common stock of the company at 102½, with adjustment of accrued dividends. Common stockholders of record Dec. 21 and also preferred stockholders will have the privilege of subscribing to the new stock to the extent of 71½ per cent of their respective holdings. The new preferred stock, of which the authorized issue is $25,000,000, is convertible from Jan. 1, 1917, up to Jan. 1, 1922, into common stock at $300 a share. The present issue of preferred, of which there is $4,483,700 outstanding, will be called for redemption at 110 and accrued dividend on or about Jan. 13 next. President Willys, being desirous that the holders of the present preferred shall have an opportunity to continue their interest in the company, has agreed to waive part of his subscription rights as holder of common stock, those rights to go to the holders of present preferred who may subscribe on the same basis as the holders of common stock.

The new preferred issue has been underwritten. A special meeting of stockholders will be called on or about Jan. 14 to authorize the new stock. The authorized amount of common stock will be increased from $25,000,000 to $50,000,000 of which a par amount sufficient for the conversion of the $15,000,000 new preferred will be reserved for effecting the conversion thereof. The present amount of common stock outstanding is $21,000,000 and $1,500,000 additional common is to be set aside for sale to employees.

Redeemable at 110

The new preferred stock is redeemable at 110. It is provided that the remaining $10,000,000 of the $25,000,000 authorized may be issued from time to time, but not before Jan. 1, 1917, for cash, provided the net quick assets of the company immediately upon the issue of this stock shall be equal to 110 per cent of the amount of preferred stock outstanding. The remaining preferred may be issued in series and the stock of different series may be at dividends at the same or a lower rate, may be redeemable at a lower price, and may be nonconvertible or convertible at higher prices for the common than those provided for the $15,000,000 issued at this time.

Subscription to the new preferred stock will be made as follows: Jan. 21, $40; Feb. 10, $30; March 1, $33.23. These payments include adjustments of accrued dividends. Subscriptions may be paid in full on Jan. 21, in which case the amount payable will be $102,889 per share, including adjustment of accrued dividends.

To Retire Present Issue

Out of the proceeds of the $15,000,000 new preferred, the present issue of $4,783,000 preferred will be retired and the balance, about $10,500,000, will be applied to the general funds of the company.

Applications will be made to list the new preferred stock and the subscription receipts on the New York Stock Exchange.

In connection with the proposed new issue a circular has been sent to stockholders showing that the company's earnings for the nine months ended Sept. 30, 1915, were over $8,500,000 of which approximately $3,500,000 was earned in the three months ended Sept. 30, 1915. These earnings compare with $5,231,274 for the year ended June 30, 1914, and $3,019,098 for the six months ended Dec. 31, 1914. The net current assets at the present time plus the net amount to be realized from the new financing are approximately one and one-half times the amount of the proposed $15,000,000 preferred stock issue and the total net assets exclusive of good will, etc., on the same basis about two and one-quarter times the proposed issue.

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Will Keep Lozier Property

DETROIT, MICH., Nov. 9—The Associated Lozier Purchasers who took over the assets of the old Lozier Motor Co. for $1,000,000 and who had the privilege of re-selling the property, consisting of the plant and land in Detroit, have notified the Detroit Trust Co., trustee, that they will keep the property. An agreement has been made whereby the price of the plant property or $225,000 will be paid in four yearly installments of $50,000 and one of $25,000 beginning Feb. 15, 1916, and on the same date of the following years, while the payment of $125,000 for the vacant land property is to be made in five annual installments of $25,000 on the same dates.

The Associated Lozier Purchasers have paid up to Oct. 15, 1915, $449,906.15 of the total purchase price of $1,000,000. The trust company has thus far paid two dividends of 5 per cent to the creditors, on allowed claims.

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National Tube Advances Prices

PITTSBURGH, PA., Nov. 5—The National Tube Co. has advanced prices for tubing, casing and drive pipe about $2 a ton.

Plath Maxwell Sales Manager

Stebbins in Charge of Executive Sales Work in Detroit —Other Promotions

DETROIT, MICH., Nov. 4—Some important promotions have been made in the sales organization of the Maxwell Motor Co., John J. Plath, who was supervisor of sales zone No. 1, with headquarters in New York, has been appointed sales manager of the Maxwell company. Mr. Plath has been with the company for over one year, being previously connected with the Colwell Lead Co., New York and Windsor, Ont.

C. E. Stebbins, who was superintendent of sales and assistant sales manager, has been promoted to have full charge of all executive sales work at the Detroit headquarters of the company.

C. R. Newby, L. K. Cooper and T. J. Toner, zone supervisors, have been attached to the general national sales staff.

The staff of zone supervisors is now as follows: L. F. Smith, Boston; E. W. Clarke, New York; H. H. Howe, Pittsburgh; J. P. Headley, Atlanta; E. M. Lubeck, Chicago; C. S. Riedel, Minneapolis; E. F. McConaha, Indianapolis; W. C. F. Morris, Memphis; G. E. Clarke, Kansas City; L. A. Smith, Dallas, Tex.; W. J. LaCasse, Portland, Ore.; E. E. Thompson, San Francisco.

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Acceptance Corp. Will Buy Notes Taken by Truck Dealers

NEW YORK CITY, Nov. 6—A new credit department has been opened by the Acceptance Corp., 55 Liberty Street, this city. Under the new plan a dealer can now accept notes in part payment for a truck which the corporation agrees to purchase from him. This enables the dealer to pay the truck maker cash for his product and permits the dealer to get the concessions, discounts and freight allowances usually made to cash customers. It will also relieve him of the bother of collecting the notes from the customer or financing any part of the transaction.

This corporation started business in 1909 and includes in its board of directors R. M. Owen, R. A. Rainey, R. H. Montgomery, E. D. Bird and D. B. Mills.

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Lakey Leaves Foundry Co.

MUSKEGON, MICH., Nov. 5—Vice-president and general manager William B. Lakey, of the Lakey Foundry & Machine Co. has resigned to give all his attention to the Pressed Steel Co. which he organized recently. This concern occupies the building formerly used by the Muskegon Pattern Works.

To Investigate Export Trade

Federal Trade Commission To Send Out Letters of Inquiry for Referendum

WASHINGTON, D. C., Nov. 6—In the near future the Federal Trade Commission will send out to the automobile and supply manufacturers a letter of inquiry, followed up by a brief schedule, as a part of the investigation of conditions that affect American foreign trade. Congress has empowered the commission to make an investigation and to report the facts with such recommendations as it deems advisable.

It is pointed out that the war in Europe has so affected the trade of the world that American enterprise has a peculiar opportunity to supply the wants of foreign markets and to secure a greatly enlarged share of their trade. The commission, therefore, deems it to be its duty to complete with all possible dispatch an investigation which may assist Congress in determining what action may be required in the public interest for the promotion of American foreign trade.

By public hearings throughout the country and by other means the commission has been gathering facts and information as a basis for its report to Congress. It now wishes to obtain information from a large number of men who were unable to appear at the hearings. For this purpose these letters and schedules will be sent out.

30,000 Letters to Go Out

About 20,000 letters will go to American manufacturers and producers and about 10,000 will be sent to other authorities on foreign trade conditions, such as export commission merchants, manufacturers' export agents, importers, domestic merchants, publicists, lawyers, economists, bankers and engineers.

A return post-card accompanying the letter is designed to give the commission a broad "yes" or "no" referendum on the advisability of export combinations and to put it in touch with those who are willing to assist the commission by furnishing further facts and suggestions. To those who state that they will co-operate with the commission in furnishing facts, etc., the schedule of inquiries will be sent, covering the topics on which the commission desires information.

The 20,000 names of manufacturers and producers include every important branch of American industrial enterprise and represent every shade of opinion in regard to the present problems of our foreign trade.

The 10,000 other persons to whom the letters of inquiry will be sent include even greater diversity of interest and thought. By obtaining facts and suggestions in this manner from a large number of persons with different experiences and points of view, the commission expects to secure a great deal of valuable information.

In its work the commission will also receive assistance from the Department of State and other government offices.

Argo Motor Co. Buys Standard Electric Plant

JACKSON, MICH., Nov. 6—A deal has been completed whereby the Argo Motor Co. has acquired the plant and land of the old Standard Electric Co. which it has been occupying. It is expected that arrangements will be made to enlarge the manufacturing facilities of the company, it being contemplated to build between 20,000 and 30,000 Argo cars for the season of 1916.

In connection with the contemplated expansion move it is announced that the Jackson Motor Parts Co. has been organized and incorporated. Its capital stock is $210,000. This concern will make principally parts for the Argo cars, but, it is said, will ultimately also make parts for the general trade. L. E. Latta, vice-president and general manager of the Argo company, has been appointed president and general manager of the new parts company. L. E. Wilson, Chicago, is now managing the Argo business and Stanley Whitwarth, Indianapolis, has become production manager.

Pettit and Gittings Case V-P.'s

RACINE, WIS., Nov. 6—Milton H. Pettit, formerly of Kenosha, Wis., was elected vice-president in charge of plants and production of the J. I. Case T. M. Co., this city, succeeding F. Lee Norton, who resigned as vice-president and general manager of the Case company several months ago. Ellis J. Gittings, whose appointment as manager of the sales department was announced a few days ago, has also been elected a vice-president, in charge of sales. Richard T. Robinson, for many years secretary of the company, also resigned recently, as noted, and is succeeded by W. F. Sawyer, formerly sales manager.

E. G. Norris McQuay-Norris Branch Mgr.

SEATTLE, WASH., Nov. 5—E. G. Norris has been appointed Northwest district branch manager of the McQuay-Norris Company, of St. Louis. He is a brother of W. K. Norris, president of the corporation which manufactures Leak-Proof piston rings. He will have supervision of Washington, Oregon, Idaho, Montana and British Columbia business, with headquarters in Seattle.

Ferro Brings Out a Twelve

On Same Lines as Ferro Eight—Overhead Valves with Detachable Cylinder Heads

CLEVELAND, OHIO, Nov. 10—It has for a long time been an open secret that the Ferro Machine & Foundry Co., this city, has been developing a twelve along the lines of the Ferro eight designed by Alanson P. Brush. It is understood that more than one experimental motor has been built and it is now announced that the size chosen for the standard product will be 2⅞ by 4½ in., giving 350.5 cu. in. displacement.

The features of the Ferro eight were commented upon and illustrated in the last issue of THE AUTOMOBILE, so there is no need to recapitulate them here, save to say that the new engine will have a twenty-four-cam camshaft and that the rocker mechanism will permit of easy adjustment of the tappets. The main features of the motor are as follows:

Weight—without starter or generator	730 lb.
Bore	2⅞
Stroke	4½
Formula hp.	39.7
Total piston displacement	350.5 cu. in.
Mean valve diameter	1¼
Valve lift	0.253
Firing order	R. 1–5–3–6–2–4 L. 1–5–3–6–2–4

Three crankshaft bearings.

Three camshaft bearings

	Dia.	Length	Dia.	Length
Front	1⅞	3 3/16	1⅛	1 15/16
Center	2	2¼	1¾	2
Rear	2⅛	2⅞	1	1 13/16

	Dia.	Length
Connecting-rod bearings side by side	2⅛	1 3/16

Starter gear ratio	10:1
Timing gear type	Morse chain
Valve type	Overhead inclosed
Lubrication	Pressure feed
Cooling	Pump

Myers Again Stutz Sales Manager

INDIANAPOLIS, IND., Nov. 6—W. D. Myers, who was sales manager of the Stutz Motor Car Co., this city, and resigned a little over a year ago, has returned to his old position with the Stutz company, that of sales manager. At the same time, announcement is made of the resignation of H. W. Anderson, sales manager of the Stutz company, effective on Nov. 1.

Mr. Myers resigned from the Stutz company to organize the Myers-Ebersole Motors Co., Kansas City, Mo., which controlled the agency for the Cole and Regal cars. This business will be continued under the management of J. H. Ebersole, though Mr. Myers will retain his interest.

Mr. Anderson, who has been identified with the automobile business for the past ten years, has not yet announced his plans for the future, but will make his headquarters at the Hotel Astor, New York City, for the present.

New Company Will Finance Time Payments On Overland Cars

Guaranty Securities Co. Formed in Toledo with Plan for Carrying Installment Paper—Three Kinds of Discount Facilities—Special Plan for Farmers

TOLEDO, OHIO, Nov. 8—Dealers selling Overland and Willys-Knight cars are now offered facilities for financing time payments on cars by a new securities company in this city, known as the Guaranty Securities Co. A guaranty plan has been worked out whereby the burden of carrying instalment paper is removed from the dealers' and distributors' shoulders and carried by the Guaranty Securities Co. Three distinct kinds of discount facilities are afforded the dealers by the new plan, namely, the discount of instalment notes on retail sales, the discount of farmers' notes on retail sales, and the discount of paper growing out of sales at wholesale by distributors to dealers, with particular reference to the winter stocking season.

In the working out of the plan, the Willys-Overland Co. has advised and suggested a course which would benefit Overland dealers, but the Willys-Overland Co. is not in any way connected with the Guaranty Securities Co.

Plan Good for Any Model

It is a method which will undoubtedly effect a great change in the selling of Overlands, for by its provisions, any dealer is in position to sell a man a machine of any model manufactured by Overland on a time basis. The buyer must, of course, be a responsible party whose notes will be good security.

Briefly, the guaranty plan consists in the securing of a down payment by the car buyer of a certain prescribed amount as given in the accompanying table, and the balance in eight monthly instalments, a note being given for each instalment. The notes secured by the dealer are then sent through the distributor to the Guaranty Securities Co., which concern discounts them, remitting all of the face value of the notes except an amount running from $100 to $200, depending upon the value of the car. This amount the dealer receives a deferred certificate for, and it is payable when and if the customer's notes are paid. But if a dealer does not want to wait for this portion of the profit, he can immediately cash the certificate at a discount of 5 per cent. This does not apply to deferred certificates on farmers' notes, which certificates are not discountable.

Going into the details of the plan, the car buyer is required to pay a small amount in excess of the list price of the car, this being for insurance and interest on the unpaid balance. The insurance covers fire, theft and transportation loss and is written under a blanket policy in the Automobile Insurance Co., Hartford, Conn., which is affiliated with the Aetna Life Insurance Co. Any scheme of reports or checking in order to make sure that insurance had been properly written on each car would be so cumbersome and costly as to be prohibitive. Therefore it was decided that the insurance should be covered by a blanket policy, it is pointed out, and that the charge for this insurance should be made in a lump sum and treated as a part of the time price of the car.

Books Sell for $1 Each

Forms have been provided on which to make the sales of cars under the guaranty plan in each of the different States so as to conform to the various laws. These forms are furnished to the dealers at $1 per book.

In making a sale under the plan, the first thing the dealer does is to make the necessary inquiries of the buyer so as to fill out the purchaser's statement intelligibly. This statement is one of the forms supplied. The mortgage and notes are then filled out, and the insurance requisition. From the moment this insurance blank is filled out and mailed by the dealer, the car is covered against fire and theft. A certificate of participation, showing the interest of the purchaser in the insurance, is issued in duplicate when the papers reach Toledo, one copy going to the customer and one accompanying the notes as collateral.

Having made the deal, the dealer indorses the notes, signs the assignment on the back of the mortgage, sending the papers on to the distributor. The latter also indorses the notes, signs and dates the mortgage or assignment and sends all the papers on to the Guaranty Securities Co. The latter then sends the money and deferred certificate to the distributor, from whom the Guaranty company actually buys the notes, but if the distributor receives them from a dealer, he at once indorses both check and certificate and sends them on to the dealer.

Dealer Must Handle Repossessions

The purpose of holding back the $100, $150 or $200 in the form of a deferred certificate is two-fold: First, the dealer's interest must be tied to the transaction until all the notes are paid, as the Guaranty Securities Co. is not in, and cannot enter, the automobile business, and in the event of a repossession of one car out of a hundred, it is necessary that the dealer handle the repossession. Therefore, it is thought only fair that he should wait for a part of his profit until his customer has paid out. The second reason is that the deferred certificate is necessary to provide the required borrowing margin for the Guaranty Securities Co. to finance the proposed purchases of this paper, which are likely to run into several million dollars. This money must come from banking centers, and in order to borrow it at the proper rate and in such unlimited quantities as to comply with the Guaranty Securities Co. arrangement with the Willys-Overland Co., it is stated that a margin of 25 per cent in the notes is necessary, so that they may deposit $1.25 worth of notes against every dollar borrowed. This margin is obtained by the deferred certificate. As already stated, these certificates are, however, cashable through the distributors at 5 per cent discount, and the distributors can in turn use them in lieu of cash in paying for cars or other merchandise bought of Overland, at a discount of 50 cents per month for the unexpired term of the customer's notes. If the certificates are for $150, the charge is 75 cents per month; $200, $1 per month.

Monthly Installment Sales Table

		Model 83		Model 84		Model 86,
		Touring	Roadster	Touring	Roadster	Touring
1	List—f.o.b. Toledo	$750.00	$725.00	$1,095.00	$1,060.00	$1,145.00
2	Interest and insurance charge	25.00	25.00	35.00	35.00	35.00
3	Time price	775.00	750.00	1,130.00	1,095.00	1,180.00
4	Cash down	275.00	250.00	530.00	495.00	580.00
5	Note one month	50.00	50.00	75.00	75.00	75.00
6	Note two months	60.00	60.00	75.00	75.00	75.00
7	Note three months	60.00	60.00	75.00	75.00	75.00
8	Note four months	60.00	60.00	75.00	75.00	75.00
9	Note five months	65.00	65.00	75.00	75.00	75.00
10	Note six months	65.00	65.00	75.00	75.00	75.00
11	Note seven months	75.00	75.00	75.00	75.00	75.00
12	Note eight months	75.00	75.00	75.00	75.00	75.00
13	Total notes	500.00	500.00	600.00	600.00	600.00
14	Deduct interest and insurance	25.00	25.00	35.00	35.00	35.00
15	Deduct discount	7.50	7.50	9.00	9.00	9.00
16	Proceeds	467.50	467.50	556.00	556.00	556.00
17	Cash	367.50	367.50	406.00	406.00	406.00
18	Deferred certificate	100.00	100.00	150.00	150.00	150.00
19	Cash from customer	275.00	250.00	530.00	495.00	580.00
20	Cash from G. S. Co.	367.50	367.50	406.00	406.00	406.00
21	Total cash	642.50	617.50	936.00	901.00	986.00
22	Five car dealers cost	630.00	609.00	920.00	895.00	962.00

For farmers' accommodation, the plan is a little different. The farmer is accustomed to pay for his goods at harvest time, and in order to meet his requirements the Guaranty Securities Co. has modified its arrangement on installment paper so that a note or notes may be given for the deferred payment due at any time up to eight months. Further, the farmers' notes will be purchased direct from dealers as well as distributors, and will not be handled through the latter at all. The deferred certificate issued on farmers' notes cannot be discounted, but must be held by the dealer making the sale until the notes are paid.

The procedure in making the sale to a farmer under this plan is substantially the same as in the deferred payment method, except that the mortgage, contract of conditional sale, or lease will not be assigned to the distributor, but the bottom assignment printed on the back of the form, running directly to the Guaranty company, will be used by the dealer instead.

Third Plan—Sight Drafts

Due to the fact that dealers in very many cases are unable during the winter season to borrow suitable amounts with which to take their allotments in cars from the distributors, and because dealers often ask for assistance so that instead of having a large number of cars in warehouses and distributing points they would be more generally distributed through the country in the hands of dealers, where they can be seen by possible buyers, the third kind of discount facilities was fostered by the Guaranty company. The plan is for the distributor to draw his draft at 1 to 4 months sight on the dealer, with bill of lading attached. These drafts will bear interest from the date of their acceptance, and each draft will usually cover a carload of cars. Drafts may be paid in whole or in part at any time up to their maturity, and interest will cease on each car covered by the draft as paid for.

There is no cost to distributor involved in this plan, as the Guaranty Securities Co. will buy the acceptances from the distributor for their face value less only the cost of accommodation. In other words, the distributor will get his full dealer price for the cars out of the acceptance. The proceeds of the draft will be sent to the distributor in cash except that a deferred certificate for $150 per car will be issued, payable when and if, the acceptance is paid by the dealer.

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Allen Plant Is Busy

BUCYRUS, OHIO, Nov. 6—The Allen Motor Co., which recently finished an addition to its motor plant at Bucyrus, reports its shops working day and night for the past sixty days and is not yet caught up on its orders for the touring car.

Buffalo Engineers Talk Motors

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Many Automobile and Motor Engineers Among 350 at Eng. Society Meeting

BUFFALO, N. Y., Nov. 4—At a meeting of the Engineering Society of Buffalo held at the Statler hotel last night, the subject of multi-cylinder gasoline engines was discussed. There were 350 members of the society in attendance, many of whom are prominent in the automobile industry.

The subject was presented by O. E. Hunt of Detroit, engineer of the Packard Motor Car Co., and the discussion was carried on by David Fergusson, engineer of the passenger car department of the Pierce-Arrow Company; O. E. Spillman of the Herschell-Spillman Co., Tonawanda; Ernest Harris, assistant to Mr. Fergusson, and Otto Burkhardt, also of the Pierce plant.

Mr. Hunt's presentation included the letter which J. G. Vincent wrote the Packard company urging the concern, of which he is vice-president, to build a twin six motor. Mr. Hunt dwelt on the engineering considerations in designing a twelve-cylinder car in particular and a multi-cylinder type in general. Mr. Fergusson defended the six and sought to prove by scientifically worked-out diagrams that the characteristics of the six-cylinder motor with the cylinders arranged in a single row are as good as those of the twelve or twin six arrangement.

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Detroit Chassis Co. Formed

DETROIT, MICH., Nov. 5—The Detroit Chassis Co. has been organized temporarily capitalized at $10,000 and has leased the plant formerly occupied by the Vitralite Co., west Grand Boulevard and Hubbard Avenue, where manufacturing of a standard chassis has been started.

It is the object of the new company to cater especially to carriage and buggy makers and offer them a chassis at a reasonable price.

Before the new concern decided to organize those interested in it investigated the possibilities of the undertaking and came to the conclusion that the idea was a good one. In fact the company started with several large orders, one of which is for 600 chassis for Smith & Sons, London, Eng.

Instead of putting out a chassis with a specified line of parts or components such as carbureter, ignition system, starting and lighting system, this part of the equipment will be entirely optional with the party or concern placing an order, and the price will naturally be made according to the equipment required. The chassis itself will be only made in one size, 110 in. wheelbase. The motor will be a four-cylinder block, 3¼ by 5. The wheels will be of the artillery type, with 32 by 3½ tires.

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To Discuss Philadelphia S. A. E. Section

NEW YORK CITY, Nov. 9—A meeting of the S. A. E. members located in Philadelphia will be held in that city to-morrow for the purpose of discussing the advisability of forming a local organization to carry on activities in that vicinity. A dinner will start the program of the evening after which there will be addresses by members of the council of the society and by members of the governing committee of the Metropolitan section who have been invited to attend.

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Schipper Treasurer Metropolitan S. A. E.

NEW YORK CITY, Nov. 9—At a meeting of the Governing Committee of the Metropolitan Section of the Society of Automobile Engineers, J. Edward Schipper, technical editor of THE AUTOMOBILE, present secretary of the section, was appointed treasurer to succeed Prof. W. C. Marshall, who recently resigned. The governing committee of the section now consists of R. McA. Lloyd, chairman; J. Edward Schipper, secretary-treasurer; N. B. Pope and Joseph A. Anglada.

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Gray Is Haynes Advertising Manager

KOKOMO, IND., Nov. 8—R. T. Gray has been appointed advertising manager of the Haynes Automobile Co., this city, and has already taken up his duties.

Mr. Gray is a graduate of the Engineering Department of Purdue University, and is well versed in the technicalities of the automobile, as well as having had considerable experience in general advertising.

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Logan with McGraw Tire

EAST PALESTINE, OHIO, Nov. 4—W. V. Logan, recently manager of the manufacturers' department of the Goodyear Tire & Rubber Co., is now associated with the McGraw Tire & Rubber Co. in the capacity of assistant general sales manager. His efforts for the immediate future will be confined to the opening of new accounts with passenger and commercial car manufacturers.

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Germans Make Alcohol from Potatoes

LONDON, ENG., Nov. 5—A report from Germany states that that country is making great use of its potatoes, of which there is a great surplus. One of the results is wood alcohol, with which automobiles are now largely driven.

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Three Bodies for National Twelve

INDIANAPOLIS, IND., Nov. 6—The National Motor Vehicle Co., this city, will equip its new Highway Twelve with

three types of bodies for 1916, including a three-passenger roadster, a four-passenger coupé and a five-passenger sedan.

All three of these body types follow out the same general trend of National body construction that has been noted in previous models. The Highway coupé sells for $2,650; the five-passenger sedan has a center door on the right side and a forward door on the left, and sells for $3,200; the three-passenger roadster sells for $1,990.

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Goodyear Gross Business Totals $36,000,000

AKRON, OHIO., Oct. 5—Gross business of the Goodyear Tire & Rubber Co. for the fiscal year to Oct. 31 last reached a new record of over $36,000,000, an increase of $5,000,000, or 16 per cent over 1914, and $11,000,000 over 1912. The company turned out more than 2,000,000 tires during the year, but in the last three months has been making 12,000 to 13,000 a day, at an annual rate close to 4,000,000. In the year 1913-1914, 1,479,883 tires were sold.

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Chalmers Stock to Pay $12 a Share

NEW YORK CITY, Nov. 4—The Chalmers Motor Co., Detroit, which has been paying at the rate of $10 a share annually on its common stock for the past four years, will start the year 1916 with an increased rate. The new basis, it is understood, will be $12 a share annually, or at the rate of $3 quarterly. The increase will start in January and will be due to enlarged production and earnings, profits so far indicating a surplus for the current fiscal year equal to $30 a share on the common. The stock is $100 par value and is selling at 160.

In August, 1910, the company declared a stock dividend of $900 a share. In October, 1912, another stock dividend of 33 1-3 per cent was declared, followed in June, 1913, with another stock dividend of 25 per cent.

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Olds Sales Gain 133%

LANSING, MICH., Nov. 5—Sales of the Olds Motor Works during August, September and October, are reported to have been 133 per cent larger than during the same period last year. The increase would have been greater had it not been impossible to produce cars in sufficient number. Production is now being increased as much as possible and the manufacturing floor space has been increased for that purpose.

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House with Vacuum Oil

DETROIT, MICH., Nov. 5—C. M. House, who was engineer of the Briggs-Detroiter Co. is now with the engineering staff of the Vacuum Oil Co. at their headquarters in Detroit.

Earn 19% on New Peerless Stock

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Based on Actual Shipments of Combined Subsidiaries for Calendar Year

NEW YORK CITY, Nov. 9—The books and accounts of the Peerless Motor Car Co., Cleveland, Ohio, and the General Vehicle Co., Long Island City, which were merged to form the Peerless Truck & Motor Corp. last week, indicate, according to a preliminary examination by Touche, Niven & Co., chartered accountants, that the earnings from actual shipments of the combined companies for the current calendar year are at the rate of 19 per cent per year on the new $10,000,000 of capital stock of the new corporation. This is after deducting interest charges on the $5,000,000 of new notes and after setting aside liberal amounts covering depreciation, etc.

Aside from the notes mentioned, the corporation will have no bonded indebtedness, except a mortgage of $300,000 on the real estate and building which it owns at Fifty-seventh Street and Broadway, this city, which is used partly as a sales depot, the equity in which exceeds the amount of the mortgage, and returns a good income.

Assets are said to have been reduced to a conservative basis by writing off all bad debts and substantial amounts covering depreciation of buildings and equipment, though both the Cleveland and Long Island City plants are of recent construction, in good condition and in a high state of manufacturing efficiency. The consolidated net current working assets of the new corporation, exclusive of plants and equipment, will amount to $3,378,000 in excess of all liabilities, $2,370,000 of this being cash in banks.

The total capitalization of the new corporation, which is organized under the laws of Virginia, is $20,000,000, all common stock, of which $10,000,000 is to be issued now while the balance is to be reserved for the conversion of the new $5,000,000 ten-year 6 per cent notes convertible after one year into stock of the corporation at par, which is $50 per share.

Probable Board of Directors

While the composition of the board of directors of the new corporation has not yet been definitely determined, it is probable that it will include the following:

C. V. Rich, vice-president of the National City Bank and president of the National City Co.; E. R. Tinker, Jr., vice-president Chase National Bank; P. J. McIntosh, 26 Broadway, president of General Gas Appliance Co., director of Montreal Public Service Corporation, Halifax Electric Tramway Co., Imperial Trust Co., Montreal, United States Industrial Alcohol Co., etc.; B. G. Tremaine, F. S. Terry, identified with General Electric Lamp Works at Cleveland; P. D. Wagoner, president of General Vehicle Co., Long Island City; L. H. Kittredge, president of the Peerless Motor Car Co., Cleveland; Harrison Williams, identified with Cleveland Electric Illuminating Co. as chairman of the board, also with Republic Railway & Light Co., Federal Utilities, Inc., etc.

The management of the subsidiary companies comprise the following directors for the Peerless Motor Car Co.: L. H. Kittredge, president; T. W. Frech, vice-president; L. H. Treadway, president of Peck, Stow & Wilcox Co.; A. B. McNairy, director of Cleveland Trust Co.; C. E. Sullivan, vice-president Central National Bank, Cleveland; H. A. Tremaine, J. B. Crouse, associated with the National Lamp Works of the General Electric Co.; and G. B. Siddall, president of the Lorain & Southern Railway.

Directors of the General Vehicle Co. are: P. D. Wagoner, president; A. W. Burchard, vice-president of the General Electric Co.; M. F. Westover, secretary of the General Electric Co., and E. A. Carolan, A. K. Baylor, W. B. Potter and F. C. Pratt, all identified with the General Electric Co.

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Stewart-Warner Earnings Estimated at 16 Per Cent on Common

CHICAGO, ILL., Nov. 4—Stewart-Warner Speedometer earnings for nine months ending Sept. 30, exceed entire earnings of 1914 and this year's earnings are estimated at 16 per cent on common stock. The company retired out of earnings $246,000 preferred stock.

The profits of the corporation for the quarter ended Sept. 30, amount to about $447,000, a record for any three-month period. For the nine-month period the profits were $1,221,350, against $848,127 for this period last year.

Plans are being prepared for a factory, six stories, at Wolfram Street and Lincoln Avenue.

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Timken Roller Bearing Business 120 Per Cent Over 1914

DETROIT, MICH., Nov. 5—The business of the Timken Roller Bearing Co. shows an increase of 120 per cent for October over the same month's business in October, 1914, and an increase of 25 per cent over the business of September, 1915, according to Herman Ely, secretary of the company. This increase is not due to war orders but to the natural increase in car manufacturers' business.

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Musgrave with Pathfinder

INDIANAPOLIS, IND., Nov. 5—H. G. Musgrave has been appointed assistant director of sales of the Pathfinder Co.

Stevens-Duryea May Resume

Negotiations Under Way for Sale of Springfield Property —New Capital Interested

SPRINGFIELD, MASS., Nov. 6—There are persistent rumors that the Stevens-Duryea cars will be manufactured again. Negotiations are in progress for the sale of the Olmstead and Tuttle factory situated off Springfield Street that has a taxed value of $69,000. James L. Doherty, trustee of the estate, admitted that negotiations are under way for the sale of the property, but he refused to say who the prospective buyer was. Officials of the New England Westinghouse Co. which bought the Stevens-Duryea plant stated that they were not looking for any other factories at Springfield. So the talk about the Stevens-Duryea reorganization became current again. The company still has its plant for the making of parts to supply owners, but it is not large enough for manufacturing purposes. But the Olmstead and Tuttle factory would give it the needed facilities. According to the information gleaned a new charter will be applied for and work started on some cars again with new capital furnished by others not identified with the old company.

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Gunn U. S. Tire President

NEW YORK CITY, Nov. 4—J. N. Gunn has been chosen as the new president of the United States Tire Co. in full charge of manufacturing and selling. He has also been appointed assistant to the president of the United States Rubber Co., of which the tire company is a subsidiary. E. S. Williams resigns the presidency of the tire company in order to devote most of his attention to the mechanical rubber business of the United States Rubber Co.

Mr. Gunn has been assisting the tire and parent company since last June in important efficiency work. During this work Colonel S. P. Colt, president of the parent company, arranged to have Mr. Gunn become assistant to the president, and at the same time, because of the desire of Mr. Williams to be relieved to a great extent from the work of directing the tire company, the recommendation by Williams that Gunn be made president of the tire company, was also put into effect.

Mr. Gunn has been a prominent figure in the automobile field, having been for 1½ years general manager of the Studebaker Corp. He has been the head of Gunn, Richards & Co., New York City, business and efficiency engineers. For the purpose of systematizing and straightening out the plan of administration of the Studebaker Corp., following the merging of the Everitt-Metzger-Flanders Co., Detroit, and the Studebaker Bros. Mfg. Co., South Bend, Ind., in 1911, he took the general managership from December, 1911, until July, 1913, when his work was completed.

S. P. Colt, president of the United States Rubber Co., states that earnings this year will not be as large as in 1914. He states that it is costing that company considerably more to make tires now than it did in the early part of the year. The cost of fabric used by this company in the make-up of tires is probably 20 per cent higher than at the start of the year. Crude rubber is about 6 cents higher than then. Some other articles used in the manufacture of tires are no higher, but the materials used average in the neighborhood of 10 per cent more than a year ago.

The company is now turning out over 8000 tires a day. It is its intention to bring the tire capacity up to between 13,000 and 14,000 tires daily in the near future.

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Approve Plan for Paying Maxwell Back Dividends

NEW YORK CITY, Nov. 10—At a special meeting held here to-day the holders of the stock trust certificates of the Maxwell Motor Co. ratified the plan recently submitted by the directors for the retirement of the accumulated 14¼ per cent back dividends on the first preferred stock by the issue of non-interest-paying warrants convertible into first preferred stock at par. The issue of $1,050,000 additional first preferred stock was also authorized at the meeting.

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Studebaker Heads $1,000,000 Tire Co.

SOUTH BEND, IND., Nov. 5—Peter E. Studebaker, son of the late Henry Studebaker, one of the founders of the Studebaker Corp., has accepted the presidency of the International India Rubber Tire Co., a $1,000,000 corporation recently organized in South Bend. The concern will make automobile tires and sell direct to the dealers.

The officers of the company are: E. H. Schwab, Bethlehem, Pa., vice-president; G. W. Odell, Findlay, Ohio, secretary; J. R. Nobile, treasurer. These men, with William S. Moore, city engineer of Grand Rapids, Mich., form the board of directors. The plant will be in South Bend.

E. R. Erskine, president of the Studebaker Corp., in response to an inquiry, stated that the proposition is yet in embryonic state and that neither the Studebaker Corp. nor any of its officials are interested financially or commercially in the proposition.

Studebaker Earns $10,000,000?

Per Share Surplus of $30 as Compared with $15 in 1914

NEW YORK CITY, Nov. 4—Earnings of the Studebaker Corp. for 1915 will fall slightly short of reaching the $10,000,000 mark, compared with a surplus for 1914 of $3,752,916 after allowing a charge-off of $402,698 for "extraordinary expenses." On the $27,931,600 common stock now outstanding these profits work out a per share surplus this year of somewhat over $30, compared with just under $15 last year.

Mostly Domestic Business

The larger part of this earning power of between $9,000,000 and $10,000,000 is from domestic business entirely.

Last week was a record one with shipments of 1510 cars, and October was the record month, with shipments of 6009 cars. All these machines were for domestic consumption. The company is doing an excellent export business to South and Central America, Australia and the Far East. Its domestic demand, especially in the East, has been very heavy. The sales in Boston, Philadelphia, and New York in the past year have doubled.

The directors of the company yesterday declared a quarterly dividend of 1½ per cent on the common stock, and an extra dividend of 1 per cent. According to a statement issued by President A. R. Erskine, this places the junior shares on a regular 10 per cent annual basis. His statement reads:

Orders Running High

"It is the belief of the management that the 1 per cent extra dividend will be declared regularly hereafter, as the current business of the company, exclusive of any so-called war orders of which the company has been a recipient, is running at a rate which will fully justify a 10 per cent return to stockholders, and will leave ample surplus earnings for the extension of the business without any necessity for borrowing."

"The corporation is now entirely free from floating debt excepting $2,308,500 of serial notes, respecting which arrangements have been made to call which is the earliest possible date on which they can be paid in accordance with the indenture under which they were issued."

The Studebaker common dividend since May 4, 1915, has been on a 5 per cent basis, 1¼ per cent having been declared quarterly. Studebaker shareholders were recently offered the right to subscribe to 26,380 shares of treasury stock at $110 a share.

Monarch To Concentrate on Eight

Adopts Distinctive Silver-Aluminum Finish for Wheels —Price Is Unchanged

DETROIT, MICH., Nov. 8—The Monarch Motor Car Co., this city, will produce only one stock model for 1916, an eight-cylinder, seven-passenger touring car, which it has christened, "the car with the silver wheels." The price remains at $1,500. Mechanically the car is the same model as previously brought out, but a number of refinements have been made in the body and finish to bring the car up to the latest design.

3 by 5 High-Speed Motor

The motor is a 3 by 5 Herschell-Spillman with the cylinder blocks set at a 90-deg. angle. The cylinders are slightly staggered, allowing the connecting-rods to be placed side by side on separate bearings, thus avoiding the yoke-end construction. The motor is essentially of the light weight, high-speed type, and will develop upwards of 74 hp. at 2400 r.p.m., according to its manufacturer. Two mufflers are used.

The gearset on the new model is made by the Detroit Gear and Machine Co., and is in unit with the motor. Drive is by tubular shaft through a double universal of standard design. Axles are of Columbia make, the rear being floating with spiral bevel gears. Gemmer steering gear is used and the drive is from the left with center control, the gearshift lever operating on the power transmission direct.

The rear springs are three-quarter elliptic and take the driving stresses. The brake rod assembly has been altered somewhat to secure a thoroughly accessible and powerful construction, and both sets are on the rear wheels. The frame has been altered so as to have a slight kick-up in the rear.

Zenith Duplex Carbureter

The carbureter is a Zenith of the duplex, eight-cylinder model, and the ignition is by the Atwater Kent automatic advance system. Starting and lighting is Ward Leonard, especially adapted to the Monarch car with flywheel application through a Bendix driving pinion. The two-unit system is used, with the motor for starting separated from the generator for lighting. Fuel feed is by Stewart vacuum system. The gasoline tank is in the rear and has been increased in capacity.

Upholstery is flush type, and of genuine, long-grain leather, being cut away from the back of the front seats, giving the effect approaching that of the double cowl body. Fenders are crowned and rounded to the curve of the wheels, which are silver-aluminum finished, giving the car its name.

The wheelbase of the Monarch is 125 in. Tires are 33 by 4½, safety tread in the rear. Equipment is unusually complete.

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6-Tonner Completes Worm Line of Gramms

LIMA, OHIO, Nov. 6—Completing the line of worm-driven trucks produced by the Gramm-Bernstein Co., Lima, Ohio, a new model rated at 5 to 6 tons capacity has recently been added to the 1916 offering of B. A. Gramm trucks. The other trucks are 1, 1½, 2½ and 3½ tons size respectively, and all models are similar in general lay-out.

The new heavy-weight replaces the former 6-ton chain-driven B. A. Gramm, and like all of the more recent B. A. Gramm productions has its motor under a conventional hood instead of between the seats as in the first 2- and 3-ton models. Another departure to be found in this model is in the motor, which, instead of having six cylinders as previously, has but four, the new four, with cylinders 4½ by 6¾ in., has 375 cu. in. displacement, the respective horsepower ratings by the standard formula being 40.8 for the six and 32.4 for the four.

The present B. A. Gramm line consists of the following models, tabulated according to principal specifications:

Capacity, Tons	1	1½	2½	3½	5-6
Price ...	$1,500	$1.800	$2,600	$3,400	$4,300
Wheelbase	118	130	156	158	168
Tires, front	34x3	34x3½	36x4	36x5	36x6
Rear...	34x4	36x5	36x4d	40x5d	40x6d
Drive....	worm	worm	worm	worm	worm

Any of these models will be equipped with an electric lighting and starting system for $200 extra, or with the lighting system only for $100 extra.

Choice of Stromberg or Zenith carbureters is offered on chassis either for domestic or export purchase, fed by gravity from a tank beneath the seat. A Bosch magneto is used for ignition.

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De Tamble Equipment Sold for Taxes

ANDERSON, IND., Nov. 4— The equipment of the De Tamble Motors plant was recently sold for delinquent taxes to Elmer Eckhouse of Indianapolis. The property consists of all machinery, engines and boilers that go to make up the plant. The amount of delinquent tax due the county by the company was $1,150.

Negotiations, it is said, are being made for the resumption of operations at the De Tamble plant. An out-of-town concern has taken up the matter of re-opening the plant, which has been practically idle for two or three years.

Cummins-Monitor Adds a Six

3 by 5 In. L-Head Motor—Car Sells for $895—To Continue Four

COLUMBUS, OHIO, Nov. 6—For 1916 the Cummins-Monitor Co., this city, will add a six-cylinder to its line, to sell at $895, and continue the four-cylinder touring car and roadster models previously made, selling at $795. The motor used in the six-cylinder model is a 3 by 5-in. L-head, designed along the lines of accessibility and light weight.

The chassis is rigidly braced and reinforced to withstand the hardest usage, yet is free from complications. A simple system of brake equalization is used, which has proved very efficient in the test of the new six. The front springs are semi-elliptic and the rear, three-quarter elliptic, underslung, with a swinging saddle, designed to prevent the usual solid impact when passing over very rough roads.

Tires are 33 by 4 with non-skids in the rear. Wheels have large drums with internal expanding and external contracting brakes, the latter being leather-covered to protect the linings from dirt and grit. The rear axle ratio is 4 to 1.

The body, which is mounted on a 115-in. wheelbase, has been designed to give ample room, both in the front and rear compartments. Upholstering is in genuine leather, and the cushions are built with extra deep springs and with a gradual slope toward the back. The body is finished in Brewster green with dark blue as an option, with the rest of the car in back. Vacuum fuel feed is employed, the gasoline tank being in the rear.

Slight Changes in Fours

Very slight changes are to be noted in the four-cylinder models. The 4-30, which has a 108-in. wheelbase, is a streamline design. Fuel is carried in the rear of the roadster and under the cowl of the touring car. The motor used in the four is a Golden, Belknap and Swartz, 3¼ by 4¼. Cylinders are block-cast, with removable head. Lubrication is by force feed to the main bearings, but the splash system is used for the other parts.

Cooling is by thermo-syphon, and the clutch is a multiple disk, the gearset being three-speed selective.

The rear axle is a Russell floating type, with 1¼-in. shafts. Hyatt roller bearings are used in the axle and the driving shaft. Brakes are inclosed to prevent mud and dust from reaching the linings. The steering gear is of the irreversible type and has a 17-in. wheel.

Splitdorf ignition is used with a 12-volt Disco electric generator and motor for cranking and lighting. Tuthill semi-elliptic springs are found in the front of the four and three-quarter elliptic in the rear.

Speedometer, ignition switch, ammeter and lighting switch are carried in a unit case on the instrument board and are illuminated at night by a dash lamp. The windshield is rain-vision, ventilating. Tires are 32 by 3½, non-skid in the rear, with demountable rims and one extra rim goes with each car.

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Jeffery Sedan for $1,165

KENOSHA, WIS., Nov. 6—The Thomas B. Jeffery Co., this city, has brought out a sedan for its four-cylinder chassis to sell at $1,165. The sedan top is easily removed, converting the car into an open machine at the first approach of warm weather.

The entire car is built in the Jeffery factory, and looks like a permanent inclosed car.

The roof of the car is of laminated wood construction covered with a fine quality of top material. The rear section of the body of the top is metal, and the supports and sills are of a very substantial character. Yet with all this strength and appearance of permanence, the weight of the top is but approximately 200 lb. Taking into consideration the removal of the summer top, this makes a total added weight of a little over 100 lb.

The glass in the windows is of 3/16-in. crystal plate, ground and polished. In the broad forward windows and in the doors, the glass is arranged to drop half way. The rear window is extra large, providing more than ample light and vision. This window and the two rear side windows are provided with silk portiere curtains.

Because of the substantial construction of the top and careful padding between the top and main body of the car, there is said to be no rattle, even over the roughest roads. This careful padding also protects the top of the touring body—doing away with the need of refinishing when the top is taken off in the summer.

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U. S. Truck Prices Lower

NEW YORK CITY, Nov. 6—The United States Motor Truck Co., Cincinnati, Ohio, has reduced its prices on its models E, D, H, J and K, effective in 1916. The old and new prices are as follows:

Model	Old Price	New Price
E	$2,550	$1,900
D	3,200	2,400
H	2,700	2,200
J	3,400	2,800
K	4,200	3,600

Stegeman Trucks Six and Two Fours

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4-Ton Six Has 3¾ by 5¼ Motor of 50 H. P.—All Motors Continentals

MILWAUKEE, WIS., Nov. 6—The new line of worm-driven trucks announced by the Stegeman Motor Car Co., Milwaukee, Wis., employs the same style of motors as was used formerly in the chain-drive vehicles brought out by that concern—Continentals. In the 1½-ton and 2½-ton trucks, a 4⅛ by 5¼-in. four-cylinder motor, developing 35 hp. is used, while the 4½-ton machine is equipped with a 3¾ by 5¼ six-cylinder, 50-hp. motor. The makers declare that the six-cylinder motor will do away, largely, with the damaging internal vibration on the large machine.

Three-point suspension is employed and the motors all are equipped with sealed governors limiting the speed to 1100 r.p.m. The car speed of the 1½-ton is 18 m.p.h., the 2½-ton, 15 m.p.h. and the 3½-ton, 12 m.p.h. Lubrication is by a combination of the splash system and double plunger pump. Cooling is by centrifugal pump, gear driven, in connection with a large radiator. A Stromberg carbureter with a hot-air connection is used.

The frame is pressed steel, channel section. In the 3½-ton Stegeman, the frame is reinforced by nickel-steel truss rods. The standard wheelbase of the 1½-ton is 150 in.; of the 2½-ton, 144 in., but this model may be equipped with a special long wheelbase, which measures 162 in. The wheelbase of the 3½-ton is 156 in.

The standard tire equipment on the 1½-ton machine is 34 by 3½ solid front tires and 36 by 5 solid rear. On the 2½-ton, 34 by 4 solid in front and 36 by 4 dual solid in rear. The 3½-ton truck is equipped with 36 by 4 solid tires in front and 40 by 5 dual solid in rear. The standard tread of the 1½-ton is 56½ in.; the 2½-ton 58 in., and the 3½-ton, 65 in. However, a special country road 2½-ton is offered with a tread of 56½ in.

The chassis weights of the 1½, 2½ and 3½-ton models are 4200, 5000, and 6000 lb., respectively, and the prices in the same order, $1,900, $2,500 and $3,000. Any style of body will be supplied, to order.

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Koehler 1-Ton Truck at $895

NEWARK, N. J., Nov. 6—Specializing in one type of chassis for a four-cylinder, shaft-driven, 1-ton capacity truck, the H. J. Koehler S. G. Co., Newark, N. J., plans a minimum output of 2000 machines for the 1916 season. This concern's product, known as the model K, sells for $895, has a wheelbase of 129 in., is equipped with a complete, roomy, flare-board type of body, perfected for the purpose of meeting a general demand for a full-ton carrying capacity. Besides, the truck is designed for speed, assuring rapid transportation.

The power plant is of the unit type, combining the motor, clutch and gearset. Three-point suspension is used. The four-cylinder motor has a 3 1-2-in. bore and a 5-in. stroke, is of the valve-in-head type, and develops 30 hp. Cylinders are block-cast, the upper part of the crankcase being cast integral. A jacketed cylinder-head contains the entire valve arrangement for the four cylinders and is easily removed. An important feature of the motor is that the exhaust gases have a quick outlet to the manifold, separate from the cylinder head, thereby giving immediate expulsion of the exhaust heat from the cylinder head ports, allowing valves and adjacent parts to be cooler and taking a burden from the cooling system.

A cone type clutch is housed with the flywheel and the gearset. Three speeds forward and one reverse are offered. All gears are made from an alloy steel containing proper parts of nickel and the shafts are mounted between annular ball bearings.

A special feature of the spring suspension is the use of graded springs both in front and rear. These springs are built up of four different thicknesses of leaves.

The internal gear drive type of rear axle is employed, all working parts of which are mounted on heavy-duty roller bearings. Both front and rear wheels are 34 in. in diameter.

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Moreland Distillate Truck Lowers Prices

LOS ANGELES, CAL., Nov. 5—The Moreland Motor Truck Co., maker of Moreland distillate trucks, this city, has announced a sweeping reduction in prices for the coming year, as follows:

Capacity	Old Price	New Price
1-ton	$1,850	$1,150
1½-ton	2,200	1,850
2½-ton	2,800	2,400
4-ton	3,650	3,200

Continental four-cylinder motors are used in the full line except for the 4-ton model, which employs a special motor of Moreland construction. The 1-ton Continental motor is of 3¼ by 5, the 1½-ton model is 4⅛ by 5¼, while the 2½-ton is 4½ by 5½. The Moreland motor on the 4-ton is 4¾ by 6¾ in.

All of the motors are fitted with the Moreland gasifier, a fuel economizer produced by the Moreland company. Proceeding on the theory that No. 1 engine distillate, a clear, colorless liquid with a gravity test of 48, and selling at an average retail price of 6 cents a gallon, was the cheapest fuel to be had on

the Pacific Coast, the company developed the gasifier to take care of the heavier fuel. The action of the gasifier is simple. It is made of cast iron to give it heat-holding qualities and the exhaust and intake manifolds are cored through the outer shell, which completely envelops them. Fresh air is drawn through holes drilled in the top of this outer shell, directly upon the exhaust and intake manifolds, and this air, now heated, is drawn down into the air intake of the carbureter, heating the intake manifold at the same time. The fresh, warm air readily vaporizes the distillate in the carbureter, with the result that the mixture is carried through the warm intake manifold, and enters the cylinders as warm, dry gas which is readily ignited.

The wheelbases of the four models are 126, 150, 168 and 186 inches, respectively, for the 1, 1½, 2½ and 4-ton models.

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DETROIT BANKRUPTS PAY DIVIDENDS

DETROIT, MICH., Nov. 9—The Detroit Trust Co., trustee for the old Briggs-Detroiter Co. is sending out a first dividend of 10 per cent to creditors of proved claims. A large number of claims are still being investigated and will be taken care of after having been approved.

DETROIT, MICH., Nov. 9—A fourth dividend amounting to 3 per cent has been paid to creditors of the bankrupt American Voiturette Co. The preceding dividends consisted of two 10 per cent dividends and one of 4 per cent, making a total thus far of 27 per cent dividends paid, or approximately $90,000.

DETROIT, MICH., Nov. 9—The Union Trust Co. will shortly pay another dividend of 10 per cent to the creditors of the bankrupt Church-Field Motor Co., Sibley, Mich. Two dividends, one of 15 per cent and the other of 10 per cent, have been paid to the creditors previously.

The trust company has also paid a 10 per cent dividend to the creditors of the bankrupt Benham Mfg. Co.

DETROIT, MICH., Nov. 9—The creditors of the bankrupt Krit Motor Car Co. of which Frank W. Blair, of the Union Trust Co. is trustee, have been paid a first dividend of 4 per cent. The creditors of the Krit Sales Co., of which Henry Lansdale is trustee, have received thus far two dividends, one of 25 per cent and the other of 12½ per cent.

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Imperial Wheel Doubles Plant

FLINT, MICH., Nov. 4—The plant of the Imperial Wheel Works is being practically doubled in size. The present daily output is said to average between 1000 and 1200 wheels and it is to be considerably increased.

No Tire Shortage in England

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Manager of Goodyear Co. of Great Britain Says Business Is Tranquil

AKRON, OHIO, Nov. 6—"We have been getting big shipments of tires in England, but even these have not permitted us to fill all our orders," says P. D. Saylor, managing director of the Goodyear Tyre & Rubber Co. of Great Britain, who has just arrived from London and is spending a few days at the Akron headquarters in the interest of Goodyear's European trade.

"Business is tranquil in London, and, contrary to the general opinion, there is no shortage of tires. It is true that the government has taken and is receiving now great quantities of tires from the manufacturers, but they have equipped themselves to take care of the increased business, and are able to fill the government orders and at the same time supply the trade. The tire manufacturers are pleased to get the government business and seek it.

"The advent of so many women into the trades formerly occupied solely by men at first occasioned not a little apprehension on the part of the trade unions, but this was amicably dispelled by the granting of men's wages to the women. All of the rubber companies are making up the difference between their men's present pay as soldiers, and their former salaries, forwarding the money to the families left behind. Consequently there is little distress among the families of the men at the front.

"The 33 1/3 per cent duty placed on automobiles has apparently had very little effect on the flow of American cars to England, as there is a strong demand for the medium-priced cars, occasioned largely by the shortage of horses. Many thousands of horses have been requisitioned by the government. The 40 per cent income tax increase, however, has begun to be felt, as has also the 50 per cent tax on the profits of all business houses, over an average of the last two years' profits."

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Downey Heads Michigan Crank Shaft Co.

LANSING, MICH., Nov. 5—Charles P. Downey has been elected president of the Michigan Crank Shaft Co., while Oliver Meyer, formerly manager of the National Engineering Co., Saginaw, Mich., has become manager.

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Electromobile Co. Consolidated

ST. LOUIS, MO., Nov. 6—The Electromobile Co. of St. Louis, maker of an electric indoor truck, has consolidated with the Orenstein-Arthur-Koppel Co. of Koppel, Pa., according to an announcement made here to-day by S. J. Bernheimer, president of the local company. Hereafter the Koppel firm will manufacture the truck and the Electromobile company will market the product in the Southwest. The latter company will continue to make headquarters here.

The truck, which was first exhibited at the 1914 St. Louis show, is now in general use in industrial plants here and in neighboring cities. The operator stands by the control at the rear of the truck.

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Indorse Battery Standards

CHICAGO, ILL., Nov. 9—*Special Telegram*—At the weekly luncheon of the Chicago section of the Electric Vehicle Association, held at the Hotel Metropole to-day, W. F. Bauer, chairman of the local standardization committee, told of the work of his organization. The local committee's recommendations as regards battery standards coincide exactly with those of the parent body in specifying side-to-side assembly in trays and giving as the reason that in the end-to-end method jars are frequently broken due to the edges of the plates hitting the side of the jar whenever the vehicle is subjected to impact.

Wide latitude in assembly methods is left to the manufacturer by the committee as any number of cells to a tray between the limits of two and seven may be used.

The sub-committee on rubber jar sizes reported that it found twenty-eight different sizes prevailing, varying in dimensions from 1/16 to ⅛ in. This, Mr. Bauer declared, has forced manufacturers to keep large amounts of dead stock on hand to meet emergencies and is one of the factors responsible in keeping up the prices of lead batteries.

Regarding charging apparatus, it was suggested that a chart should be arranged to enlighten the garage man as to what he should do to eliminate losses through improper methods. Secretary McCall announced that the Commonwealth Edison Co. will give everyone who has charging apparatus a guarantee that current will not cost him more than 4 cents a kw-hr. if he charges batteries for others when asked.

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Soennichsen Forms Parts Co.

MILWAUKEE, WIS., Nov. 4—A. M. Soennichsen, one of the founders of the Auto Parts Mfg. Co., Milwaukee, has resigned as general manager to organize the A. M. S. Co., this city, manufacturer of automobiles parts and accessories. G. W. Browne and T. C. McMillan are associated with Mr. Soennichsen. A factory is being established in the Manufacturers' Home Bldg., foot of Mason Street.

227,467 Registration in N. Y.

57,296 More Owners and Dealers Than in 1914—77,675 Chauffeurs

NEW YORK CITY, Nov. 6—Up to Nov. 1, 1915, there were registered in New York State 227,467 automobile owners and dealers and 77,675 chauffeurs as compared with 167,755 owners and dealers in the same period in 1914 with 64,326 chauffeurs. The receipts in 1915 were $1,860,050.50 as compared with $1,506,933.86 in 1914.

In the whole year of 1914 only 170,171 owners and dealers were registered with 67,170 chauffeurs. Receipts for that year amounted to $1,533,367.86.

	Owners and Dealers	Chauffeurs	Receipts
Nov. 1, 1915..	227,467	77,675	$1,860,050.50
Nov. 1, 1914..	167,755	64,326	1,506,933.86
Total, 1914...	170,171	67,170	1,533,367.86

Olds Reduces Eight $100

LANSING, MICH., Nov. 10—*Special Telegram*—The Olds Motor Works, this city, has reduced the price of its type 44 eight-cylinder car from $1,295 to $1,195. This car, which was described in THE AUTOMOBILE for Oct. 21, has a V-type eight-cylinder Northway motor with cylinders 2⅞ by 4¾, a 120-in. wheelbase, leather-faced cone clutch, floating axle, three-quarter elliptic springs, open driveshaft with two universals and three-speed gearset.

Studebaker Amplifies Territorial Work

DETROIT, MICH., Nov. 5—The Studebaker Corp. has provided a western and an eastern division in the office of the territorial manager. T. E. McMeans, formerly of the claims division, has been promoted to territorial manager for the western division, while W. C. Shanafelt retains the eastern district. To their duties has also been added that of looking after the service system.

Reliance Takes Saeger Engine

LANSING, MICH., Nov. 4—The Reliance Engineering Co. has taken over the Saeger Engine Works, and expects to greatly increase its production capacity of automobile parts. The Reliance company has been supplying a large amount of parts for the Chevrolet Motor Co., and it is rumored, but not confirmed, that the control of the Reliance company is now in the hands of the same interests who control the Chevrolet company.

650 Grant Cars a Month

FINDLAY, OHIO, Nov. 6—The Grant Motor Co., this city, is running on a regular spring schedule, producing about 650 cars per month, and orders for actual shipment and for storage by its larger dealers and distributors will absorb every car it can make up to March 1. From then on until the end of the season, the production will be largely augmented.

The company recently erected two large buildings for stock storage purposes, one 60 by 225 ft., the other 50 by 200 ft., and is about starting work on an addition to its final assembly plant, of a building aggregating 20,000 sq. ft.

War Order for Gersix

PORTLAND, ORE., Nov. 4—The Gerlinger Motor Car Co., this city, maker of the Gersix truck, has received large orders for export. This is the only six-cylinder truck made on the Pacific Coast. One of the warring nations has placed an order for ten trucks a month, commencing the first of the year.

Kokomo Companies Increase Facilities

KOKOMO, IND., Nov. 8—A large brick addition is being built by the Kokomo Brass Co., and associated companies, Byrne Kingston & Co., and the Kokomo Electric Co. These concerns are now supplying some of the largest concerns in the automobile and tractor industries.

Maxwell to Add 130,000 Sq. Ft.

DETROIT, MICH., Nov. 8—The plant of the Maxwell Motor Co. on Oakland Avenue, where the assembling and shipping departments are located, will be greatly enlarged. An additional factory building, one-story high, 130 by 1000 ft. with sawtooth roof will be erected, thus adding 130,000 sq. ft. of floorspace to the plant.

Auto Body to Buy Acme Plant?

LANSING, MICH., Nov. 5—The Auto Body Co., which has been expanding very rapidly during the last year, is reported to be negotiating with the Acme Engine Co. for the purchase of the latter's plant, which is located opposite that of the Auto Body Co.

G. V. Strike Settled

LONG ISLAND CITY, Nov. 5—The two weeks' strike of 550 employees of the General Vehicle Co., this city, for an eight-hour day instead of nine, has been ended. The strike was called in sympathy for the machinists on strike at Schenectady.

Walpole Creditors Receive Dividend

BOSTON, MASS., Nov. 5—The receivers of the Walpole Tire & Rubber Co. have been authorized to pay another dividend of 5 per cent by Judge Dodge in the United States District Court. This makes 90 per cent paid on claims allowed. The receivers expect to pay another dividend later. They have $200,000 on hand now.

Fight Glare Rule in St. Louis

Accessory Dealers Claim Ordinance Hurts Business and Increases Accidents

ST. LOUIS, MO., Nov. 6—Automobile men, especially accessory and supply dealers, are making loud and bitter complaint against the St. Louis anti-glare headlight law which they say is responsible for a decrease in their business as well as for the unusual number of automobile accidents which have occurred in this city since the dimmer ordinance went into effect.

The wholesale arrests of motorists whose lights did not comply with the new law, the accessory men say, have so frightened the owners of cars that many, ignorant of the exact requirements of the law, are operating their machines with dim lights, dash lights and in many cases without any lights.

To this they attribute the fact that the total of deaths caused by automobiles during the current year has been brought up to fifty-five and the injured to approximately 300 during the last few weeks. Last month alone twelve persons were killed by automobiles here and nearly a hundred injured. Those favoring the ordinance point out that the number of cars has increased 100 per cent, while accidents have increased only 33 per cent.

Insurance men have joined hands with the accessory dealers in condemning the ordinance which prohibits the use of lights whose rays are more than 3 ft. above ground at a distance of 75 ft. in front of the automobile. Companies which have placed liability insurance on automobiles have been besieged during the last few weeks as never before with claims for injury to persons and machines alike.

The law defeats its own purpose, in the opinion of the insurance and accessory men. It was adopted in the belief that dazzling headlights bewilder pedestrians and motorists coming from opposite directions. On the contrary, opponents of the law argue, glaring headlights served to warn pedestrians.

Shorter Hours for Mercer Men

TRENTON, N. J., Nov. 6—The Mercer Automobile Co., this city, is the second largest concern in Trenton to voluntarily grant its men a shorter week. The company will hereafter count fifty hours a week, instead of fifty-four as at present, and the wages will remain the same. About 350 machinists are employed. Last week the John R. Roebling's Sons Co. also reduced the working week of its machinists without any reduction in wages.

Gasoline Goes Up 1 Cent

Both Standard Oil and Independents Advance Prices—Trouble in Georgia

NEW YORK CITY, Nov. 4—Another advance of 1 cent occurred last week in the gasoline field. Garages in New York City are charging owners 22 cents a gal., an advance of 1 cent a gallon. During the summer the low price was 16 cents. The price of gasoline in northern New Jersey to the owner has been increased 1 cent to 19 cents by the gasoline delivery wagons.

Philadelphia gasoline has been advanced 1 cent, to 15 cents a gallon. Boston gasoline also received a 1 cent advance and is now quoting at 19 cents on the tank wagon basis. Standard Oil in that city has advanced the price 1 cent to 19 cents, tank wagon basis, meeting the earlier advance of the independents.

The Standard Oil of Nebraska has advanced the price of gasoline on tank wagon basis to 13 cents a gallon and has made corresponding advances throughout its entire territory. In Omaha, the price has been advanced ½ cent to 13 cents, tank wagon basis. The last thirty days has seen a rise from 10 cents, the low price this summer, and in fact the low price since March.

The S. O. of Kentucky has advanced gasoline prices 1 cent to 14½ cents, tank wagons and garage basis.

At Nashville S. O. now quotes at 16 cents a gallon to garages and 16 cents in lots of less than 100 gal. The Gulf Refining quotes the straight price of 17 cents. The price last March was 10 cents a gallon.

The independents have advanced their price 1 cent to 11.8 cents a gallon, tank wagon basis. This meets the price of the S. O. which has not been changed since the last previous advance.

The Atlantic Refining Co. in Pittsburgh, has advanced gasoline 1 cent a gallon to owners. Gasoline is now quoted at 17 cents a gallon, 68-70 deg., 19 cents, and 76 deg. at 12 cents. The prices on March 31 were 9 cents, 11 cents and 13 cents respectively.

In Detroit, gasoline is selling at 13 cents at practically all filling stations and garages, whether received from S. O. or some other company. This is an increase of 1 cent over the former price, which itself had been raised 1 cent, from 11 to 12 cents.

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Georgia to Prosecute Gasoline Dealers

ATLANTA, GA., Nov. 4—Between fifty and seventy-five retail and wholesale dealers in gasoline located in several Georgia cities are to be prosecuted by the state department of agriculture for violation of the State law which forbids the misbranding of gasoline as to the specific gravity of same.

This law requires that all retailers shall post signs, showing the specific gravity, and it is understood that some of the prosecutions will be for failure to brand at all.

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Higher Market Prices

NEW YORK CITY, Nov. 9—Prices in metals, lubricants and rubber last week were higher. The metals, after a substantial gain the previous week, made a new record when all the products listed under that head, made gains. Copper, aluminum, Bessemer and Open-Hearth steel and lead featured the market. Crude rubber was stronger with a 2-cent rise. This was due in the main to a stronger market in London and reports of a firmer situation in Brazil. The demand was more active, though manufacturers, as a rule, were disposed to restrict their purchases to moderate lots.

The oils and lubricants market was stronger last week. Gasoline prices in general are higher. Yesterday, New York gasoline went up to 18 cents a gallon in steel barrels. Pennsylvania crude petroleum saw a rise of 5 cents a barrel. Lard oil closed yesterday at 92 cents with a gain of 7 cents for the week.

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Five More N. A. C. C. Members

NEW YORK CITY, Nov. 5—Five more companies have been admitted to membership in the National Automobile Chamber of Commerce, including the Milburn Wagon Co., Toledo, Ohio, maker of the Milburn Electric; Lewis Spring & Axle Co., Jackson, Mich., building the Hollier Eight; Argo Motor Co., Jackson, Mich., the Argo car; Empire Automobile Co., Indianapolis, Ind., Empire; and Consolidated Car Co., Detroit, Mich., Abbott.

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October Shipments 15,972 Carloads

NEW YORK CITY, Nov. 5—At the regular monthly meeting of the National Board of Directors of the National Automobile Chamber of Commerce, Inc., held at the headquarters of the Chamber here yesterday, the Traffic Committee reported that October shipments of automobiles amounted to 15,972 carloads as compared with 10,443 carloads shipped in October, 1914, or an increase of over 50 per cent. In September of this year shipments amounted to 17,190 carloads.

Automobile shipments for the past year for each month are as follows:

1914	
October	10,433
November	6,719
December	6,378
1915	
January	8,369
February	11,273
March	16,442
April	17,112
May	13,642
June	15,325
July	12,517
August	15,359
September	17,190
October	15,972

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Continental $416,000 Dividend

DETROIT, MICH., Nov. 4—Papers were filed with the County Clerk by the Continental Motor Mfg. Co. showing that in addition to the increase of its capital stock from $2,400,000 to $2,900,000, a stock dividend of $416,000 was declared which goes to present stockholders. Of the new capital stock of the company, $900,000 is preferred and it will be subject to redemption at par, Oct. 1, 1932. It may, however, also be redeemed before that date at $105 per share, plus accumulated dividends, after sixty days notice to holders.

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Chandler Stock Oversubscribed

NEW YORK CITY, Nov. 5—So eager have subscribers been for the increased issue of common stock of the Chandler Motor Car Co., which was listed at 85, that the total amount was oversubscribed a dozen times at the date of closing the subscriptions. This oversubscription was largely due to the fa-

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.54	.54	.55	.54	.56	.56	+.02
Antimony	.34	.34	.35	.34	.35	.35	+.01
Beams and Channels, 100 lb.	1.67	1.67	1.67	1.67	1.77	1.77	+.10
Bessemer Steel, ton	25.00	24.50	25.00	25.00	25.50	25.50	+.50
Copper, Elec., lb.	.18	.18	.18⅛	.18	.18¼	.18¼	+.00¼
Copper, Lake, lb.	.18	.18¼	.18⅛	.18	.18¼	.18¼	+.00¼
Cottonseed Oil, bbl.	7.65	7.50	7.65	7.75	7.50	7.58	—.07
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.45	.45	.45	.45	.45	.46	+.01
Gasoline, Auto, bbl.	.17	.17	.17	.17	.17	.18	+.01
Lard Oil, prime	.85	.85	.85	.85	.85	.92	+.07
Lead, 100 lb.	4.90	4.90	5.00	4.90	5.00	5.00	+.10
Linseed Oil	.62	.62	.62	.62	.62	.62	...
Open-Hearth Steel, ton	26.00	26.00	26.00	26.00	27.00	27.00	+1.00
Petroleum, bbl., Kan., crude	.80	.80	.80	.80	.80	.80	...
Petroleum, bbl., Pa., crude	1.80	1.80	1.80	1.80	1.85	1.85	+.05
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	...
Rubber, Fine Up-River, Para	.57	.57	.57½	.57	.57½	.59	+.02
Silk, raw, Ital.	4.40	...	4.45	...	...	4.60	+.20
Silk, raw, Japan	4.25	...	4.50	...	...	4.50	+.25
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	36.00	36.25	36.63	34.75	36.00	36.25	+.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

vorable financial standing of the company, which for the nine months ending September, showed a profit of $950,000 earnings on stock, and it is estimated that the net earnings for the calendar year will be in excess of $1,000,000. F. C. Chandler, president of the company, states that the company has at present $690,000 in cash, which will be increased by the new money going into the concern to $1,786,000. The only liabilities are $125,000 current bills not due. President Chandler estimates the earnings for the coming year at approximately $2,000,000.

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Gray-Dort Co. to Make Cars in Canada

CHATHAM, ONT., Nov. 6—Capitalized at $500,000 of which $300,000 is paid up, the Gray-Dort Automobile Co. has been organized here to make the Canadian Dort cars.

Robert Gray, of the Gray-Campbell Co. and J. D. Dort, who has been president of the Dort Motor Car Co., Flint, Mich., are the heads of the new company. F. Knight will be superintendent. Frank Averill has also come here from Flint to join the new organization.

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Remsen Heads N. A. C. C. Committee

DETROIT, MICH., Nov. 2—The National Automobile Chamber of Commerce has named A. H. Remsen, assistant office manager of the Studebaker Corp. as chairman of the repair parts policy committee of the chamber.

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Dividends Declared

Pratt & Whitney Co.; quarterly 1½ per cent on preferred, payable Nov. 15.

Maxwell Motor Co. quarterly, 1¾ per cent on preferred.

Security Prices Lower

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War Stocks Drop — Reactionary Tendency Starts—Tire Issues Fairly Strong

NEW YORK CITY, Nov. 10—Motor stocks have suffered heavily in the last ten days, General Motors dropping 22 points; Maxwell 19; and Willys-Overland 45, the heavy losses being generally due to reactionary tendency that set in over two weeks ago. Practically all motor stocks have sold off while railroad stocks have shown perceptible gains.

These and other stocks which have been making phenomenal rises since July 29 are now suffering a few similar setbacks. Yesterday General Motors dropped 20 points; Studebaker 21; Maxwell 12, and Overland 21. The present price of these four leaders in the motor stock market is still high compared with Aug. 1, at which time General Motors was 203 and it is now 370. At that time Studebaker was 83¾ and is now 215. Maxwell was 36 and is 65½. Overland was 147 and is 215. There is nothing unusual in the declining prices in these stocks in the last few days, the drops being due to some of the holders trying to realize the heavy profits they have made in the last few weeks.

Most important in the motor stocks is the new issue of Willys-Overland consisting of $15,000,000 out of an authorized $25,000,000 of new convertible 7 per cent preferred stock to be offered to holders of common at 102½ to the extent of 71½ per cent of their holdings.

Portage Rubber and Peerless featured the market last week. The former stock closed on Saturday at 80 with a net gain of 20½ points. Its security rose to 98 with a gain of 4 points. Portage officials expect this fiscal year to duplicate the record of the preceding twelve months, when 15 per cent was made for common. The company has no war business; it is increasing capacity by a small addition, and when that is completed will be able to turn out 600 tires a day. It is reported that sales for 1916 are looming up 100 per cent greater than those for 1915. Peerless common went up 25¼ points, closing at 147¼.

Chalmers common went up 6 points. This stock, it is said, will be put on an annual dividend basis of $12 a share early next year. Profits the current fiscal year are said to be equal to about $30 a share on the common, which has been paying yearly dividends of $10 a share for four years.

Quotations in the Detroit markets were generally higher. Paige-Detroit kept up its rise, this week going up 15 points. General Motors, after dropping 16 points the previous week, rose 18 points, closing at 370.

700 Trucks Sold to France

NEW YORK CITY, Nov. 10—Sales of motor trucks last week to the French government totalled approximately 700 trucks. The companies from whom the purchases were made has not been announced. The trucks were of the conventional sizes that the government has been purchasing for the past year.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com	No quotations available at this time on account of war.		300	..	..
Ajax-Grieb Rubber Co., pfd			101	..	..
Aluminum Castings, pfd			102	..	..
J. I. Case, preferred			86	87½	+3
Chalmers Motor Company, com			156	160	+6
Chalmers Motor Company, pfd			102	104	..
Chevrolet Motor Co			123	126	—7
Electric Storage Battery Co			70	72	—1
Firestone Tire & Rubber Co., com			770	775	+20
Firestone Tire & Rubber Co., pfd			112	..	..
General Motors Company, com			369	371	—23
General Motors Company, pfd			113	114¼	..
B. F. Goodrich Company, com			71	73	—5
B. F. Goodrich Company, pfd			111	113	—2½
Goodyear Tire & Rubber Co., com			328	333	—6
Goodyear Tire & Rubber Co., pfd			110	112	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co., com			35	37	—4
International Motor Co., pfd			64	67	—1
†Kelly-Springfield Tire, com			76	77	..
†Kelly-Springfield Tire, 1st pfd			94	97	—1
†Kelly-Springfield Tire, 2d pfd			76	77	..
Maxwell Motor Co., com			67¾	68¾	—15
Maxwell Motor Co., 1st pfd			97	97¾	—3½
Maxwell Motor Co., 2d pfd			57	59	—6½
Miller Rubber Co., com			249	252	+9
Miller Rubber Co., pfd			109½	110½	+ ½
New Departure Mfg. Co., com			..	..	..
New Departure Mfg. Co., pfd			..	..	..
Packard Motor Car Co., com			130	135	..
Packard Motor Car Co., pfd			100	102	..
Paige-Detroit Motor Car			465	..	+5
Peerless Motor Car Co., com			147¼	147¾	+25¼
Peerless Motor Car Co., pfd			92	96	..
Portage Rubber Co., com			80	85	+20½
Portage Rubber Co., pfd			98	100	+4
Regal Motor Co., pfd			15	20	+1
*Reo Motor Truck Co			21	22	+1¾
*Reo Motor Car Co			40	..	+1½
Splitdorf Electric Co., pfd			..	..	..
Stewart-Warner Speed. Corp., com			75	76	+ ½
Stewart-Warner Speed. Corp., pfd			106	..	..
Studebaker Corp., com			162	163	—10
Studebaker Corp., pfd			113	115	—2
Swinehart Tire & Rubber Co			90	92	—1
Texas Co.			169	170	—1
U. S. Rubber Co., com			55	56	— ½
U. S. Rubber Co., 1st pfd			106¾	107¾	+1¼
Vacuum Oil Co			215	220	..
White Co., pfd			110	..	..
Willys-Overland Co., com			238	242	—22
Willys-Overland Co., pfd			109	111	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
ACTIVE STOCKS					
Chalmers Motor Co., com	..	97	160	165	+5
Chalmers Motor Co., pfd	..	93½	101	103	—1
Continental Motor Co., com	155	180	230	260	+20
Continental Motor Co., pfd	..	75	89	94	+1
General Motors Co., com	59½	62	370	390	+18
General Motors Co., pfd	80½	82	113	114	+1
Maxwell Motor Co., com	10½	..	71	74	—12½
Maxwell Motor Co., 1st pfd	36	..	98½	101	—1
Maxwell Motor Co., 2d pfd	14	17	57	60	—6½
Packard Motor Car Co., com	..	100	130	135	+1
Packard Motor Car Co., pfd	88½	..	100	101	— ¼
Paige-Detroit Motor Car Co	..	..	480	..	+15
*Reo Motor Car Co	21¼	22	45	49½	+7½
*Reo Motor Truck Co	10⅞	11½	24	25	+3⅛
Studebaker Corp., com	..	..	162	166	—8
Studebaker Corp., pfd	..	..	109	112	..
INACTIVE STOCKS					
*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	215	..	..
*W. K. Prudden Co	18½	..	22	24	..
Regal Motor Car Co. pfd	..	25	18	..	..

*Par value $10. †New stock when issued.

100,000 See Los Angeles Show

78,000 Paid Admissions at Dealers' Assn. Exhibit —Many Cars Sold

LOS ANGELES, CAL., Nov. 1—Credit for California's most successful automobile show must go to the Motor Car Dealers' Association of Los Angeles. A show has at last been staged on the Pacific Coast which ranks with the salons of the East.

The great Broadway Automobile and Flower Show, which came to a close at midnight last night, eclipses anything of the kind ever before attempted on the Pacific Slope. Not only was the Broadway Automobile and Flower Show a great success from the standpoint of the dealer selling at retail, but an overwhelming success from the standpoint of the distributor. There were 78,000 paid admissions. It is claimed that a quarter of these were prospects as only those interested in motor cars attended the show. Including passes 100,000 attended the salon.

Pleasure cars only were exhibited. Floorspace sold for fifty cents per square foot. Many firms were unable to secure space the last ten days before the opening of the show. The expenses of the show were heavy; but with several thousand dollars cleared for the association, another show under the same auspices is assured for next season.

The last week in October seems to be the best time for a show in Los Angeles. The orange growers who purchase cars annually in southern California to the amount of about $5,000,000 have their money in the banks for the last year's crops and are able to judge what the crops will be for the coming season. The walnut growers have just finished harvesting their crops. The beet and bean growers have their money and the motion picture people who buy cars in great numbers each year, have returned from their vacations and are looking for the latest models to spring at the holiday season.

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150 Studebaker Dealers Meet

BOSTON, MASS., Nov. 8—The annual convention of the New England Studebaker dealers was held last Friday at the Hotel Lenox at Boston, Mass. About 150 dealers were present and Manager George N. Jordan of the New England branch had charge of the affair. Addresses were made by Vice-president James G. Heazlett; Vice-president L. J. Ollier; Sales Manager R. T. Hodgkins; H. A. Biggs, Advertising Counsel; H. T. Myers, manager of the commercial department; F. P. Bump, manager of the New York branch; Lafayette Markle, Chicago distributor; A. L. Davis, Cleveland distributor; H. W. Blevins, Toledo distributor; Joseph Donovan, Boston distributor.

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Los Angeles to Have Permanent Used-Car Show

LOS ANGELES, CAL., Nov. 4—The largest tent in the world houses the latest novelty of the automobile industry established in Los Angeles. It is a used car show. The tent has a capacity of 5000 persons and 500 cars, the show being for the purpose of displaying for sale and exchange the largest supply of automobiles ever housed under one roof.

For many months, there has been a great used car business carried on within a short distance of the heart of the city on vacant lots. Realizing that this business will suffer from the winter rains and that there is a great deal of business to be done after dark, the Union Auto Bus Co., a California corporation with a capital of $75,000, has erected the great tent and will operate the used car show, auctions, sales and exchanges. Real estate is also exchanged for cars and cars for real estate.

A gasoline and oil station is operated on the grounds. In another side tent there is a restaurant. There is also a tent given over to a large accessory stock and another canvas top houses a garage and repair shop.

Inside the main tent there is a large circular track for demonstrating purposes. There is also an elevated runway in the center of the track for testing brakes, gears and motors. This elevated bridge will also be used at the weekly auction as the "block."

These auctions are to be held each Saturday. Cars are entered in the market place for the sum of $1.

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Connecticut Saxon Owners to Organize

NEW HAVEN, CONN., Nov. 6—Plans are under way to form the Connecticut Saxon Society comprising owners of that make of cars throughout the State. The idea is to have all Saxon owners who visit the New York show register there and be entertained by the factory officials, and next summer there is planned an entire day's outing at Savin Rock. One of the features also planned is to have some skilled factory mechanics on hand to give demonstrations to owners how they may repair their cars and get the best service from the machines.

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Studebaker Officials Reach New York

NEW YORK CITY, Nov. 9—A Studebaker business conference was held at Hotel Astor to-day where 150 dealers under the jurisdiction of the local branch met to listen to talks by the factory heads, who are making a tour of the branches throughout the country.

Develop Community Garage

Promoters to Sell One Share Only to Each Automobilist —To Provide Service

MILWAUKEE, WIS., Nov. 6—A community garage and supply system that is likely to furnish a model for other sparsely settled sections of the country is being worked out in Jackson County, Wis.

A number of business men of Black River Falls, have conceived the idea of organizing the 500 motorists of the county into a corporation for mutual benefit. The corporation is to build a garage and supply store which will also serve as clubhouse, and the wants and requirements of all members can thus be met in metropolitan fashion. The garage is to employ competent mechanical help and be prepared to repair, wash and overhaul cars of members at reasonable prices. Supplies will also be sold. It is also the intention of the corporation to act as selling agent for every automobile dealer who becomes a member of the association.

The corporation is to be incorporated with $15,000 capital, divided into 600 shares at $25 par value. A permanent organization is to be perfected on or about Dec. 15. R. P. Rainey and F. A. Parsons of Black River Falls are now canvassing all owners in the county for stock subscriptions, and it is the plan of the promoters to sell only one share to any one individual to make the corporation a true co-operative association.

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Miles Goes to Chicago

NEW YORK CITY, Nov. 6—Samuel A. Miles, general manager of the national automobile shows at New York and Chicago, has gone to the latter city to make the preliminary arrangements for holding the big exhibition Jan. 22-29.

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Try Semaphores in Chicago

CHICAGO, ILL., Nov. 5—A street semaphore for controlling Chicago traffic is being tried out at the intersection of two of the busiest thoroughfares of the city. This is of the conventional Stop-and-Go type and on the top is a combination red and green light similar to the type used for railroad switch signals. The red shows, for instance, north and south while the green shows east and west. Whether or not the semaphore will be definitely adopted on Chicago boulevards has not been determined as yet, but the trial is proving that this particular instrument undergoing test does not place the signal sufficiently high. It is only 8 ft. above the street and high limousines and cars with tops up obstruct the view

of the signal from those in following cars. It also is thought the letters are not large enough to be readily seen at sufficient distance. Another and temporary objection to the semaphore is the fact that Chicago motorists have become educated to listening to the whistle rather than looking for a visible signal and some of them the first day or two have failed to observe the signal at all.

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St. Joseph to Have $2,000,000 Speedway

SAINT JOSEPH, MO., Nov. 4—Saint Joseph is to have a $2,000,000 2-mile speedway. Land for the building of a speedway at Lake Contrary, in the southern limits of the city, was donated by holders of concessions at that place.

Preliminary work will begin at once and the first races will be held early next spring.

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Dealers Score in Separator Fight

NEW YORK CITY, Nov. 10—The Automobile Dealers Association of New York City, has won an important step in its fight with the fire department against the use of oil separators in garages. Recently the fire commissioner refused to grant a permit to a certain garage on the ground that it did not have an oil separator. On this action being taken the dealers asked for an order of mandamus requiring the fire commissioner to grant a permit. The Supreme Court, before which this action was brought, has ordered that the entire matter be heard before a jury, at which hearing the questions of fact with regard to the necessity of oil separators will be determined.

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Another Ahlberg Bearing Branch

MINNEAPOLIS, MINN., Nov. 6—The Ahlberg Bearing Co., Chicago, Ill., has opened a branch office and exchange agency at 926 Marquette Avenue, this city, placing L. J. Bohan as branch manager. The company now has branches in New York, Boston, Cleveland, Detroit, St. Louis, and Los Angeles.

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Vesuvius Plug Cheaper to Dealers

NEW YORK CITY, Nov. 8—The price to the dealer of the Vesuvius spark plug made by A. R. Mosler & Co., has been reduced from 75 to 55 cents; this is a 20-cent increase in profit, for the plug will still retail at $1. At the same time the price to the jobber has been reduced from 60 to 40 cents.

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Rueschaw in New York

NEW YORK CITY, Nov. 10—R. C. Rueschaw, sales manager of the Reo Motor Car Co., arrived in this city yesterday on a swing around the country. He has been in the far West and on the Northwest coast recently. He states that demands for cars are unprecedented, especially in Canada.

Woman Wins Maxwell Efficiency

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33.37 M. P. G. Not Highest Average, But She Did Not Take on Supplies

DETROIT, MICH., Nov. 8—By driving from Buffalo to Haverhill, Mass., a distance of 567 miles, without taking on extra gasoline or oil on the road and thus averaging 33.37 miles to the gallon, her consumption being 17 gal., Miss Eva Cunningham was declared the winner in the Maxwell Dealers' Efficiency Run, which started from Buffalo Sept. 28 and continued for several days after, or until the contestant had reached his home town.

The test or run was part of the convention of the Maxwell dealers of zone No. 1, which includes the New England States, New Jersey, New York, Maryland and eastern Pennsylvania, the dealers taking delivery of new Maxwell cars at the plant in Detroit and starting the home drive from Buffalo.

About 100 started, but owing to the bad roads in many parts of the country through which some had to drive they either gave up the contest or did not care to be considered as contestants. About thirty sent in their sworn affidavits showing exactly what they had done, and from the reports it was seen that the test was in many instances a most severe one.

Two contestants, F. J. Cunningham, Haverhill, Mass., and George D. Robinson, Springfield, Mass., averaged better than the winner, the former covering a distance of 516 miles on 14 gal., thus averaging 36.85 miles to the gallon while Robinson consumed 13 gal. of gasoline to cover 453.8 miles, or an average of 34.90 miles to the gallon. Both of these contestants, however, took on an extra supply of oil during the run while the winner did not take any extra supply and for this reason she was declared the winner.

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Louis Nikrent with Chevrolet

LOS ANGELES, CAL., Nov. 5—Louis Nikrent, until recently a member of the Mercer racing team, has given up racing and is now in charge of the service department of the Los Angeles branch of the Chevrolet Motor Co. of California.

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115 Studebakers on Four-Day Run

DETROIT, MICH., Nov. 8—To-day 115 Studebaker cars started in different parts of the country on a four-day reliability tour promoted by the Studebaker Corp., the contestants being principally dealers and distributors of Studebaker cars. The start was made as near as possible at 6 a. m., the day's run being over a course of about 250 miles. All cars used are either fours or sixes, standard stock, with full touring equipment, and carrying the number of passengers for which the car is designed. An observer in every car will keep track of happenings on the road. A record of the gasoline and oil consumption will be kept. The total distance of 1000 miles to be run in the four days is to be covered as nearly as possible in 48 hr. of actual running time. The tour has been arranged to get a gasoline and oil consumption record under ordinary touring conditions throughout the country.

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Duffy Gets Standard in New York

NEW YORK CITY, Nov. 6—A Standard agency has been opened in New York by the Duffy Motors Corp., factory distributor in New York, New Jersey and Connecticut. The company has leased the property on the southwest corner of Broadway and Sixty-third Street for its show rooms and also has obtained adequate service facilities in the immediate neighborhood.

The Standard Steel Car Co., Pittsburgh, Pa., has been making automobiles for nearly three years.

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Lavine Gear Not Reorganized

NEW YORK CITY, Nov. 5—In THE AUTOMOBILE for Oct. 28 it was stated that D. L. Robertson is secretary of the reorganized Lavine Gear Co., Racine, Wis., and that President Uihlein of the company is a member of the family owning the Schlitz Brewing Co. of Milwaukee. These statements were in error, Mr. Robertson being office manager and purchasing agent of the company, which has undergone no reorganization, while Mr. Uihlein has no connection whatever with the Schlitz brewery.

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No Truck Show for Philadelphia

PHILADELPHIA, PA., Nov. 5—At a recent meeting of the board of governors of the Philadelphia Motor Truck Association it was decided not to hold a show the week after the annual show of the local automobile trade association. Several of the commercial vehicle agencies in Philadelphia will hold independent exhibitions in their establishments.

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Traffic Law for Pedestrians

NEW YORK CITY, Nov. 6—The Street Traffic Society of the Safety First Society at a meeting recently decided that for the better safeguarding of pedestrians greater authority should be given to the traffic police to regulate and direct foot travel upon the public streets and that it should be unlawful for any person to cross a street in the middle of a block.

To Make Automobile Spokes—Elrod & Co., Columbia, Ky., will establish a plant at Erwin, Tenn., to make automobile spokes and other stock. A building has been secured.

Toledo Light Co. Adds—The Electric Auto-Lite Co., Toledo, Ohio, will erect a concrete and steel addition, 103 by 385 ft., three stories. The company makes lamps, horns and other accessories.

Atlas Brass Adds—The Atlas Brass Co. plans a large addition to the plant, located on South Park Street, Columbus, Ohio. The company has found a large increase in business by the manufacture of automobile parts and accessories.

Bowser Adds—The foundation for a new three-story building to serve as vault has been laid by the Bowser company of Fort Wayne, Ind., and the building will be completed as soon as possible. It will be about 25 by 40 ft., and will be of absolutely fireproof construction, as all valuable papers of the company will be placed in it. Work on other buildings at the Bowser plant is progressing rapidly. The fireproof testing building is nearly completed.

Gisholt Machine in New Plant—The Gisholt Machine Co., Madison, Wis., turret lathes and other machine tools, has taken occupancy of the $40,000 addition erected because the rush of business crowded the former quarters to the utmost limit of capacity. The new building affords 25,000 sq. ft. of floor space. Approximately the same space has been added by the leasing of adjoining factory buildings recently vacated by the General Electric Co.

Clayton & Lambert Increase Force—The Clayton & Lambert Mfg. Co., Detroit, Mich., which makes automobile sheet metal parts and sheet metal stampings, will increase its working force from 500 to 1000 men or more. Additions to the plant are being completed and additional machinery and equipment is being installed. The business of the concern is said to have increased over 50 per cent during the last few months. More orders are on the books now than ever before.

Vulcanized Products' Addition Completed—The Vulcanized Products Co., Muskegon, Mich., new addition was completed a few days ago and the manufacturing of inner tubes has started. Within a fortnight the manufacturing of casings will also be started. When the plant will be in full operation it is expected that 200 complete tires will be made daily. Fifty more men are being added to the working force, it being the intention of the company to gradually expend and produce tires on a large scale. W. N. McDonald is factory manager.

Marathon Tire Warehouse in Omaha—The Marathon Tire & Rubber Co. is at present negotiating for the establishment of a warehouse in Omaha. This will in no way interfere with their present distributors or alter their sales plans. The establishment of the warehouse is to facilitate shipments to its distributors in that section of the country.

H. H. Replogle has been appointed manager of the middle west division with headquarters at Omaha.

No merchandise will be sold at retail from the warehouse. The local retail business will be handled by the Akron-Marathon Rubber Co. and its sub-agents.

Safety Engineers Meet at Philadelphia—Interesting and instructive addresses were given by safety engineers, in conjunction with numerous charts, photographs and devices, at the fourth annual congress of the National Safety Council, held Oct. 19, 20 and 21, at the Bellevue-Stratford Hotel, Philadelphia, Pa. Points on safety to workmen and methods of sanitation in industrial plants, whether woodworking, textile or automobile, were ably brought out by the various speakers, each versed in his particular line of work. The automobile industry is represented on the board of directors by J. M. Eaton of the Cadillac Motor Car Co., Detroit, and L. B. Robertson of the Ford Motor Co., Detroit.

The Automobile Calendar

Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 20.....Arizona 150-mile Grand Prix.
Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

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Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park. C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Automobile Trade Assn. Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Robbins Chalmers Portland Representative—J. M. Robbins, formerly of Denver, has been appointed Chalmers representative in Portland, Ore., succeeding Marc Bunnell, at present in San Francisco.

Weidely Heads Los Angeles Pathfinder—W. A. Weidely, son of George A. Weidely, motor manufacturer, has been appointed manager of the Los Angeles Pathfinder branch, which serves the entire southern California and Arizona territory.

Gallagher Goes to Chicago—Jos. A. Gallagher, for many years with the Autocar company and the Swinehart Tire & Rubber Co., has been appointed branch manager for the American Taximeter Co., New York City, in Chicago.

Blanchard Makes Change—William Blanchard, who was prominent in the affairs of the Lenox Motor Car Co., Boston, Mass., acting as sales manager and treasurer, has resigned, and he is now sales manager of the Cunningham Motor Car Co. in that city.

Clemens Heads Detroiter Branch—The Detroiter Motor Car Co., Detroit, Mich., has opened branch sales rooms at 676 Woodward Avenue. The factory branch has been placed in charge of W. J. Clemens. Mr. Clemens disposed of the Clemens Motor Sales Co. in Buffalo, N. Y., in order to form his present connection with the Detroiter company.

Coburn Heads New Boston Maxwell—The Coburn-Draper Motor Co. was organized at Boston, Mass., last week to take over the retailing of the Maxwell in that city that the J. W. Bowman Co. gave up. The new company has leased one-half of the Peerless Building at 660 Beacon Street, where it will have sales and service station. Ralph Coburn, who has been identified with the Maxwell for eleven years, and was manager of the New England wholesale branch, is president and W. H. Draper of Providence, treasurer. S. W. Munroe has been sent on from the Detroit factory to take charge of the wholesale branch.

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Dealer

Handling Car Refinishing Paste—The Auto Lacker Sales Co., Denver, Col., has established a branch office at St. Louis, in the Wainwright Building. A. J. Short and C. A. Smith are in charge of the local office. The company's product is a paste which when mixed with water is used as a refinisher for automobiles.

Motor Men in New Roles

Tiffany Detroit McGraw Tire Manager—G. W. Tiffany has been appointed manager of the Detroit branch of McGraw Tire & Rubber Co., East Palestine, Ohio.

Chase Joins Anderson Electric—E. H. Chase, Jr., has become a traveling salesman for the Anderson Electric Car Co., Detroit, Mich. His headquarters will be in Philadelphia.

Frazier Goes to St. Louis—P. G. Frazier, formerly with the Philadelphia branch of the Kelly-Springfield Tire Co., has taken charge of the St. Louis, Mo., branch of the same company as manager succeding H. L. Smith.

Connick Goes to Los Angeles—H. J. Connick, former Chevrolet dealer at Greenville, S. C., has been appointed supervisor of agencies for the southern California district, making his headquarters in Los Angeles, Cal.

Tucker Service Manager—C. H. Tucker, formerly service manager of the Cole Automobile Co. of Missouri, has been appointed service manager of the De Luxe Automobile Co., St. Louis distributor of Oldsmobile and Metz cars.

Sanborn Heads Detroit Branch—A branch has been established at Twelfth Street and the G. T. R. R., Detroit, Mich., by the Booth Felt Co., Brooklyn, N. Y., felt manufacturers. The branch is in charge of M. R. Sanborn.

Barrabee Forms Own Company—S. L. Barrabee, for some years a partner of the Brophy-Barrabee Co., one of the big accessory firms at Boston, Mass., has retired from the firm and gone into business for himself at 133 Columbus Avenue. His brother Frank has joined him.

Huyck Makes Change—Edgar Huyck, formerly with the Hendie tire factory at Torrance, Cal., has opened a tire and repair establishment at 772 East Third Street, San Bernardino, Cal., with Boyd Hocker, manager of the Pomona Valley Canning Co., Pomona, as a business associate.

Hill Cadillac Representative—F. J. Hill, formerly with the Hupp Motor Car Co., Detroit, Mich., has been appointed southwestern representative of the Cadillac Motor Car Co. His territory will include Georgia, Florida, Alabama, Mississippi, South Carolina, parts of Tennessee and Louisiana.

Holloway Heads Frisco Saxon—R. E. Hollaway, formerly with the H. O. Harrison Co., San Francisco, has been appointed general manager of the Saxon Sales Co., with headquarters in San Francisco. This company will distribute Saxon cars in the Northern California territory, taking over the Saxon agency from the Pearson-Saxon Co.

Apger in Garage Business — H. C. Apger, who until recently was with the Pacific Kissel Kar Branch at Los Angeles in the capacity of sales manager, has purchased the Corner Garage, located in Huntington Park, Cal., formerly owned and operated by the firm of Moore & Stringer. J. F. Smith, former service manager with the Kissel Kar branch in Los Angeles, is associated with Apger.

Tetzlaff Makes Change—Teddy Tetzlaff, formerly with the Lord Motor Car Co., in the capacity of supervisor of agencies throughout Arizona and southern California for the Maxwell, is now with the Harold L. Arnold organization, Dodge and Hudson distributors. The former speed king's new title is district booster salesman. He is to spend his time out with the sub-dealers as an efficiency man..

Ackerson Transferred—C. L. Ackerson, recently manager of the Winnipeg branch of the Maxwell Motor Co., Detroit, has been transferred to Windsor, Ont., where he will make his headquarters and take over the duties of general sales manager for Canada. F. W. Wilkins, recently manager for Saskatchewan, has been transferred to Winnipeg, and will have charge of sales in the western district.

Duffee Makes Change—E. L. Duffee, who has been manager of the New York branch of the Midgley Tire & Rubber Co., Lancaster, Ohio, since the opening of this office some months ago, has been recalled to the home office, where his services are required in another capacity.

E. S. Benson, recently with the Hartford Rubber Works, Hartford, Conn., is now manager of the New York branch of the above company.

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Dealer

Hartford Auto Parts Moves—The Hartford Auto Parts Co., Hartford, Conn., which was forced out of the Colt's west armory by the expansion of the latter concern, has taken a portion of the old Cheney silk mill on Morgan Street. Some time ago the company announced that it would remove to New Britain, where a satisfactory proposition was made by those interested in the company. For a time at least the company will remain in Hartford.

Trade News from Wash.—Lou Schabel, 1302-6 South E Street, Tacoma, Wash., has secured the agency for Swinehart tires.

The Thompson Lubricating Co., Tacoma, has secured the agency for Savage tires.

The Seven Seven Co., Spokane, Wash., and Inland Empire distributor of Dodge cars, has moved into its new garage, at First and Adams Streets.

New Willard Service Stations.—The Willard Storage Battery Co., Cleveland, has added the following service stations to its list: Edward E. North, Warren, Ohio; E. B. Vivian, Monroe, Mich.; The Sleeper Co., Fowler, Ind.; Oriental Auto Co., Chanute, Kan.; Meredith Battery Service Station, Springfield, Mo.; Iowa Battery Service Station, Hampton, Iowa; and Lebanon Storage Battery & Magneto Co., Lebanon, Pa.

Large U. S. Tire Deal—What is said to be one of the biggest tire deals ever closed was effected here this week between the United States Tire Co. and the Simmons Hardware Co., St. Louis. According to officials of the tire company the transaction involved a million dollars' worth of tires. Hereafter the Simmons company and its branch houses in Philadelphia, Toledo, Memphis, Wichita, Kan., and Sioux City, Iowa, will distribute United States tires.

Gas Engine Efficiency Reincorporates—The Gas Engine Efficiency Co., St. Louis, has reincorporated and hereafter will be known as the Efficiency Oil Corp. The incorporators are President Edward Sterns, O. L. Menzing and C. B. Hollister. A retail sales room has been opened at 3213 Locust Street with Hollister in charge. The company manufactures a product which is mixed with the gasoline so as to provide cylinder lubrication.

Late Texas Trade News.—C. H. Gray Rubber Co., Dallas, Tex., has added the Silver King and Blackstone tires.

The Herff-Brooks Automobile Co., Dallas, has been organized by W. C. Blanchard, Dallas, and J. A. Dinwiddle of Fort Worth. Temporary quarters are in the Linz Building.

The Ilseng Motor Car Co., Fort Worth, State distributor for the Monroe, has opened offices at 236 Commerce Street. H. Lester is in charge.

Trade Items from Missouri.—The Sears-Cross Spedindicator has opened a branch office in Kansas City at 205-7 East Eighteenth Street, Kansas City, Mo., under the management of Ed. S. Michelson. A complete branch and service station has been established.

The National Motor Car Co. is now operating a garage at 310 Boonville Street, Springfield, Mo., in a building extensively remodeled for the purpose. Lee A. Patterson is manager, being associated with Dixon Brothers in the operation of the garage.

The district branch and service station of the Hartford Suspension Co., Kansas City, Mo., has been moved to more convenient quarters, with better equipment, at 207 East Eighteenth Street. It formerly was at 1803 Grand Avenue.

Los Angeles Items.—The Kay & Burbank Co., Los Angeles, Cal., has opened a large Delco service station at 1101-3-5-7 South Figuroa Street. In addition to an extensive business as Delco specialists the concern is one of the largest Exide battery depots on the Pacific slope.

J. S. Bushby has opened a garage at 710 West Eleventh Street, making a specialty of Packard and Chalmers repair work.

H. G. Pendell, 1239-51 South Figuroa Street, has been appointed district distributor of Zenith carburetors. Pendell also handles the Commerce and Atterbury truck lines.

Milwaukee News.—The Storage Battery Service Co., organized recently in Milwaukee by C. F. Seifert and W. W. Zeige, has been appointed distributor of Exide batteries. Headquarters are at 137 Oneida Street.

The Philip Gross Hardware Co., 218-220 Third Street, has been appointed distributor of Eveready storage batteries, manufactured by the American Ever Ready Works of the National Carbon Co.

Lando L. Albert, for five years associated with the Hickman-Lauson-Diener Motor Car Co., then State agent for the Ford, has established a Ford repair shop at 187 Oneida Street and is making a specialty of repairs on this make.

An official service station for the Stewart-Warner Speedometer Corp. has been established at 182 Fifth Street, under the name of Speedometer Service & Supply Co.

The Dayton Rubber Sales Co., 415 Cedar Street, has taken the agency for the W. & C. shock absorber for Ford cars, manufactured by Phil. H. Webber & Co., Hoopeston, Ill.

Baltimore Trade Items—J. R. M. Adams, Franklin and Eutaw Streets, Baltimore, has entered the automobile business, as the representative of the Sphinx car. The firm for some time has been handling accessories.

The Baltimore Sewed Tire Co. has leased property at 522 North Eutaw Street, and expects to get into operation at once. C. E. Erdman, G. B. E. Erdman and L. D. Pritchard comprise the firm. In conjunction with the tire renewal business the new concern will handle automobile accessories and will be equipped to handle tire repairing and vulcanizing.

The Double Mileage Tire Co., Inc., 533 North Howard Street, is in charge of Earle E. Ramsdell, general manager. The headquarters of the firm is Buffalo, N. Y. The firm makes a new 4000-mile tire out of two old ones.

The Perfek Device Co., 535 West Baltimore Street, is placing a carbon remover and gasoline saver on the market.

Maurice L. Knight, 1025 West Mulberry Street, is manufacturing dimmers.

The Southern Engineering Corp., 223 West Saratoga Street, will handle a full line of supplies.

Oliver Garage & Machine Co., 1439 North Central Avenue, is now equipped for general repairing and the selling of accessories, as well as in a position to handle storing and hiring.

F. M. Schwalm, 329 Title Building, Baltimore, is the distributor for Maryland of Gaso-Tonic.

Recent Minneapolis Additions—Bohn E. Fawkes, representing the Oldsmobile in this territory, will erect at once a $40,000 brick, terra cotta and glass building at Hennepin Avenue and Harmon Place. The structure will be three stories. L. H. Fawkes of the Fawkes Auto Co. has bought an adjoining tract for $20,000 and will erect an automobile building.

The Ahlberg Bearings Co. of Chicago has opened a branch at 926 Marquette Avenue for sale of annular thrusts and double row and Rodax bearings.

Accessory House for Winnipeg—The Alfred Maw Motor Co. has opened in Winnipeg, Man., and will handle automobile accessories and will make arrangements to handle agencies for a low and medium-priced line of cars. The headquarters are at 417 Portage Avenue.

Electric Products Opens N. Y. Office—The Electric Products Co., Cleveland, Ohio, has opened its Eastern branch office at 30 East Forty-second Street, New York City, in charge of F. W. Eller and J. P. Lyons.

Louisville Agent Moves—The Motor Sales Co., Louisville agent for the Stearns and Saxon, has moved its office and salesroom from 728 South Fourth Street to 931 South Third Avenue.

M. & S. Gear in Canada—The Canadian Fairbanks-Morse Co., with branch houses in all of the important cities throughout the Dominion of Canada, has closed a contract with the M. & S. Gear Co., Detroit, to act as the Canadian distributor for the M. & S. differential.

Moon Agency in Central America—E. H. Serrano of Havana, Cuba, has made arrangements to handle the Moon car in Central America.

Will Repair Radiators—A radiator hospital and factory has been opened by W. C. Craig and F. L. Wilson of Tulsa, Okla., at 422 Bond Avenue, N. W., Grand Rapids, Mich. The men will make a specialty of repair work on radiators. At present they conduct a similar establishment in Tulsa.

Ford Service in Yonkers—The fiftieth sales and service branch of the Ford Motor Co., Detroit, Mich., has been opened by the company in Yonkers, N. Y. Several others are being planned, but arrangements have not progressed to the point where a definite announcement can be made at this time.

Trade News from Spokane—The Oldsmobile Co., Spokane, Wash., Inland Empire distributor for the Oldsmobile has closed a contract to handle in addition the Denby truck in the same territory, which includes all of Washington east of the Cascades, and practically all of Idaho, including the Boise territory. Frank Liddell will have charge of the truck department.

The Seven-Seven Co., Dodge distributor, has recently taken the agency for Kelly-Springfield tires, and has appointed sub-agents for the tires at all of the principal towns of the Inland Empire.

W. J. Ball Motors Co. has become the Inland Empire, distributor for Pierce-Arrow cars and truck.

Eclipse Spark Plugs in Detroit—The Cutting, Armstrong & Smith Sales Co., Detroit, Mich., has been appointed representative for the Eclipse Mfg. Co., Indianapolis, Ind., manufacturer of the Giant and Hercules spark plugs.

Takes Ideal Jack Agency—The Auto Device Sales Co., 139 Oneida Street, Milwaukee, has taken the agency for the Ideal automatic jack for the state of Wisconsin. The company is a large jobber and retailer of specialties, including the Adco shock absorber, manufactured by the Auto Device Mfg. Co. of Milwaukee.

Late Iowa News Items—Splinter & Holscher, garage proprietors at Earlville, Iowa, are installing a modern electric generating outfit for the charging of automobile storage batteries. They also are adding a large lathe to the equipment of their garage.

G. A. McLoney and J. E. Bigler of Moberly, Mo., have bought the Overland Garage at Keokuk, Iowa, and will continue it under the old name. Both are experienced men. Overland cars and fixtures are a specialty and expert machinists will handle an extensive repair business.

R. W. Phelps of Tipton, Iowa, has leased the Ross Building in that city and will establish an exclusive Ford garage, where Ford cars and accessories only will be carried. It will be known as the Phelps Motor Co.

John Hanson and John Hadley of the Waterloo Overland Co. have approved plans and specifications for a new four-story Overland garage and district headquarters at East Fourth and Franklin streets, Waterloo, Ia.

Philadelphia News Items—The Packard Motor Car Co., Philadelphia, has extended to its employees the privilege of acquiring military instruction at the recently organized Drexel-Biddle Military Instruction Camp. The leave of absence is accompanied by full pay and will not affect the regular vacation period allowed them.

The Studebaker agency at Broad and Callowhill Streets, Philadelphia, is receiving bids for remodeling the showroom, including extensive interior decorating.

The Stevens-Duryea Motor Parts and Service Station opened on Nov. 1 at 3001 Montgomery Avenue, Philadelphia, under the proprietorship of Archie Thompson. The garage has a capacity for 100 automobiles.

The Standard Supply and Equipment Co., 1710-12 Market Street, Philadelphia, will shortly move its accessory and general equipment business to new and larger quarters at Thirteenth and Cherry Streets.

The Keystone Repair and Service Co. is preparing to erect a garage and station at 5117-19 Frankford Avenue, Philadelphia. It will be of brick, one-story high, and will cost $2,000.

The Birch Motor College, Inc., to conduct schools in motoring and engine construction, was recently incorporated with a capital of $20,000 by H. M. Brown, M. E. Shakespeare and L. S. Dorsey of Wilmington, Del.

Wisconsin News Items—The Enger Motor Sales Co., recently incorporated at Milwaukee by R. D. Mitchell and E. D. Galt to represent the Enger in the Wisconsin territory, is establishing offices and service station in the new garage building on Eleventh Street, near Grand Avenue, adjoining the Auto Mart.

The Creek Motor Sales Co., 447 Jackson Street, Milwaukee, representing the Apperson and Inter-State in Wisconsin and upper Michigan, has disposed of its agency contracts, lease on its garage and salesrooms and stock of supplies, accessories, etc., to J. C. Fowler of La-Crosse, Wis., who has taken possession.

C. A. Kinney has sold the Colfax Garage at Colfax, Wis., to a new firm organized by Charles Paul and Edward B. Rosenberg of Colfax, and styled the Paul & Rosenberg Auto Co. The company takes over the agencies for the Buick and Overland. Talvin Bronken is retained as mechanical superintendent.

P. A. Peeters of Green Bay, Wis., has organized the Peeters Welding & Cutting Co., which is remodeling the Gehr Building at Pine and Jefferson Streets for its purposes. The concern will specialize in car work but will also conduct a general machinery repair business.

The Luther Grinder Mfg. Co., 285 South Water Street, Milwaukee, manufacturing an extensive line of tool grinders and similar appliances, is now operating double turn in most departments and at full capacity in others in order to cope with the demand from car and munition factories and jobbers and retailers in farm supplies. The company operates a large 6-story plant. Although this is generally a quiet season, the business this year is far and away beyond that of any previous year.

Andreas M. Soennichsen, inventor and designer of car parts and accessories, who recently retired from the Auto Parts Mfg. Co., Milwaukee, has organized the A. M. S. Co. of Milwaukee to engage in the manufacture of a line of newly patented articles for the car trade. A plant has been established in the Manufacturers' Home Building, foot of Mason Street, Milwaukee. The company is capitalized for $10,000 and in addition to Mr. Soennichsen the incorporators are G. W. Browne and T. C. McMillan of the Overland-Wisconsin Co. and G. W. Browne, Automobiles, Inc., Milwaukee. The products will include shock absorbers, windshields, bumpers and fenders, etc.

Illinois Trade Items—James Keller, formerly of the Portage Rubber Co., Chicago, purchased the Kenny Tire Shop at the corner of Fourth and Jackson Streets, Springfield, Ill. He will handle the Miller and Portage tires in Sangamon County.

The Irwin-Overland Automobile Co., Quincy, located at 300-310 Maine Street, has completed extensive improvements which include two additional offices, one for Leaton Irwin and the other for F. R. Lusk. Another story will be added to the building later, which will be utilized for accessories. The firm has decided to embark in the wholesale tire business and will utilize the concrete basement for storage purposes. A two-story building, 190 ft. in length at 217-321 Maine Street has been leased and will be utilized as a store room for cars. Starting with a 500-car contract per annum, the firm has increased this until the contract for next year calls for 1800 cars.

B. Pinkerton, president of the Pinkerton Motor Car Co., Peoria, has leased the old plow shop in Pekin, Ill. This structure contains three stories and will be utilized as a warehouse for the storage of Ford cars and accessories, and also as a branch office for Pekin and Tazewell county trade. A service station will also be established.

Noah Henline, for several years an automobile salesman in Bloomington, Ill., being employed by T. K. Hays and later by C. U. Williams, has resigned from the latter firm to enter the office of the Dodge Bros., at Memphis, Tenn., and will have charge of the southern distribution of cars for this firm.

Baltimore Co.'s Add—The Poehlmann Automobile Co., Chevrolet distributor, Cathedral and Chase Streets, Baltimore, will open a new department for automo-

bile supplies. J. R. Manuel will have charge of the new department.

The International Motor Co. will award contract for the building of a garage at 1006-1012 North Eutaw Street. The new building will be one story, 66 by 150 ft., of brick and reinforced concrete.

Denver Men Make Changes—W. A. Murphy, who recently secured the Colorado and Wyoming distributing agency for the Detroit Package Wagon, has now opened permanent quarters at 1608 Broadway, Denver.

W. S. Dawson, recently sales manager for the Charles F. Cole Motor Co., Pathfinder distributor, now has a similar position with J. M. Patrick, 1515 Cheyenne Place, Colorado and Wyoming distributor for the Lewis, Abbott-Detroit and Kissel.

Sam Stephens, for three years Pierce salesman for Tom Botterill, Denver, has been made assistant to C. A. Biggs, recently appointed Mountain States district representative Dodge Bros., with headquarters at 1608 Broadway.

York Dealer Builds—With the incorporation of the York Auto Exchange, R. P. Anderson, manager, this week, plans were started for the erection of a $20,000 fireproof garage and salesrooms on the southwest corner of East King and Queen Streets, where the company has purchased a plot of ground 90 ft. by 60 ft. The new firm, which will trade under the name of the Anderson Auto Sales Co., is capitalized at $30,000. It will hold the agency for the Cadillac, Studebaker and Reo cars and will maintain a repair station and handle a line of accessories. The business which the York Auto Exchange now maintains at the corner of North Duke Street and Clarke Alley will be discontinued when the new garage is ready for occupancy.

Fisk to Enlarge in Boston—The Fisk Rubber Co. has bought two large parcels of real estate at Boston, Mass., on Beacon Street, one adjoining the lot upon which the Peerless, Hudson, Autocar, King and Firestone Tire buildings are erected, and the other on Deerfield Street. The first piece of property comprises 17,000 sq. ft., taxed for $123,000, and the company will have a new building erected there for general offices and salesrooms. The other property comprises 14,000 sq. ft. taxed for $56,000, and a two-story service station will be erected there. It is said that the company paid in the vicinity of $200,000 for the land. The new location is at the big junction point of Commonwealth Avenue and Beacon Street.

Denver Fisk's New Building—The Fisk Rubber Co. is breaking ground for a new building at 1200 Broadway, Denver. It will be 50 by 125 ft., one story and full basement, and will cost $25,000 to $30,000. The main feature will be a service room large enough for ten or twelve cars, which will furnish a big improvement over the recent branch headquarters at 1635 Broadway. The new building is expected to be ready for occupancy by the first of the year.

Represents Kalamazoo Spring—The Cutting, Armstrong & Smith Sales Co., Detroit, is now representing the Kalamazoo Spring & Axle Co. of Kalamazoo, Mich.

New Master Carbureter Distributor—The Master Carbureter Corp., Detroit, has appointed the Lincoln Garage, South Bend, Ind., as its distributor for South Bend and vicinity.

Commercial Body Moves Offices—The Commercial Auto Body Co., St. Louis, Mo., has moved its offices and salesroom to its factory at Sixteenth and Pine Streets, St. Louis.

Spokane Items—O. J. Goeffinger and Albrecht Gross of New York City have opened the Washington Magneto Exchange at 1017½ Sprague Avenue. Mr. Goeffinger was formerly in the automobile business in New York, while Mr. Gross was associated with the Wisconsin Magneto Co. of Milwaukee. The new concern will be agent for the Rayfield carbureter and other accessories. It will handle and repair all kinds of electrical equipment and magnetos.

F. A. Williams has taken the agency for the Republic truck, the deal having been closed with H. W. English, representative of the Republic Motor Truck Co.

St. Louis Battery Co. Moves—The Moerschell Electric and Auto Supply Co., St. Louis, is making preparations to move into its new quarters at 2944-2946 Locust Street, a new building treble the size of the present quarters of the company. This firm is the exclusive agent for Willard batteries in St. Louis, and will have a charging capacity of 600 machines a day at the new plant.

Kansas City Department Store Tire Agent—The Jones Store Co., one of the largest department stores in Kansas City, is the first department store there to put in a tire department. The store has bought the equipment and business of the Pennsylvania Tire Co. agency known as the Tire Service Co.

Seattle Items—The Matthews Motor Car Co. is the name of the new distributors of Jeffery cars in Seattle and western Washington, located at 1409 Broadway. At the head of the company is J. G. Matthews, who for thirty-five years was in the banking business in Kentucky. Associated with Mr. Matthews are Dr. S. N. Colliver, vice-president; J. W. Bailey, secretary, and J. F. Scearce, treasurer.

Swinehart Tire Sales Co., Seattle, has secured the agency for Continental and Stanweld rims.

New Incorporations

Delaware

DOVER—Smith Form-a-Truck Co.; $100,000; maker. J. F. Curtin, S. B. Howard, S. A. Anderson.

WILMINGTON—E. I. du Pont de Nemours Powder Co.; 240,000. E. N. McCarney.

Indiana

AUBURN—Union Automobil Co.; $100,000; makes. C. M. Brown, John Zimmerman, W. H. Schaab.

CHURUBUSCO—Churubusco Auto Co.; $5,000. F. Fegel, W. E. Moudy, W. S. Moudy, A. M. Hire.

FORT WAYNE—Wayne Garage Co.; $2,500. C. V. Pion, C. E. Pfeffer, E. L. Pfeffer.

JEFFERSONVILLE—Bensinger Automobile Co.; $5,000 Archie Bensinger, A. B. Bensinger, Clifford Bensinger.

Illinois

CHICAGO—Chateau Garage; $2,500. P. S. Oberweise, H. W. Leybourne, F. N. Wood.

HUBBARD WOODS—Hubbard Woods Motor Car Co.; $5,000. F. J. Haarth, Pearson and W. N. Schnedder.

PEORIA—Fitch Auto Supply; $6,000. Robert Fitch, C. Lynch, M. M. Fitch.

Michigan

ST. JOHNS—Hayes Truck Wheel Co.; $100,000; maker. C. B. Hayes.

Missouri

ST. JOSEPH—Diamond Motor Co.; $2,500 to $5,000.

North Carolina

YADKINVILLE—Seagraves Ford Transportation Co.; $5,000. W. B. Seagraves, H. B. Seagraves, J. C. Wallace.

New York City

NEW YORK CITY—Twentieth Century Garage; $60,000. T. B. Hoy, M. L. Shav, B. J. Beck.

NEW YORK CITY—Voultry Tire Co.; $10,000. J. Coldmixon, A. S. Hoffheimer, F. S. Voultry.

NEW YORK CITY—Wheeler Motor Co.; $10,000. H. A. Stralliolz, C. W. Williamson, L. V. Chew.

NEW YORK CITY—Winn Taxi Service Co.; $5,000. E. J. Winn, Jacob Levine, Herman Yachnin.

NEW YORK CITY—Keyless Auto Clock Co.; $125,000. O. A. Perry, F. Phinney, E. J. Hogerty.

NEW YORK CITY—Armstrong Rubber Co.; $200,000; tire maker. G. F. Armstrong, S. X. Newman, S. Mallach, 60 St. Nicholas Avenue.

New York

HUDSON—Hudson City Crescent Garage; $50,000. O. A. Coon, H. S. Williams, W. H. Beardsley.

LARRABEE—Deyo Motor Truck Co:; $80,000. H. C. Larrabee, A. C. Crossley, A. J. Parsons.

LONG ISLAND CITY—I. S. Automobile Radiator Co. to Long Island Automobile Radiator Co.

ROCHESTER—No-Bust Tire Co.; $100,000. A. G. Small, H. L. Barner, A. M. Ferguson.

New Jersey

PATERSON—Griffin Carbureter Co.; $25,000; maker.

Ohio

AKRON—General Rubber Mfg. Co.; $200,000. M. O'Neil and others.

CLEVELAND—R. C. Hull Supply Co. to R. C. Hull Electric Co.

COLUMBUS—Twenty-first Street Auto Laundry Co.; $1,000. J. Thirston, K. T. Churston, E. C.

ELYRIA—Overland-Elyria Co.; $10,000. A. L. Jackson, C. Jackson, L. B. Fauver, R. H. Rice.

MARION—Marion Tire and Rubber Co.; $300,000. A. J. Berry, W. T. Jones, J. L. Price, W. F. Meyer, R. T. Lewis, W. H. Holvertott, S. P. Lippincott.

Pennsylvania

PITTSBURGH—S. S. V. Motor Co.; $10,000. J. H. Weeks, J. R. Zinkman, C. B. Gearing, J. F. Tyrell.

Texas

PARIS—Lamar Motor Car Co.; $7,500. Ed. Hutson, H. H. McClanahan, T. A. Johnson.

Virginia

CLIFTON FORGE—Virginia Garage Co.; $30,000. B. H. Tatum, E. A. Snead, B. C. Goodman.

RICHMOND—King & Wright Co.; $15,000; buying and selling engines. H. D. Wright, H. R. Scott, A. G. Collins.